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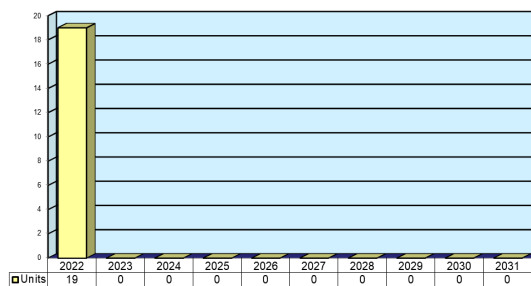
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ZPY-1 STARLite

Outlook

- U.S. Army MQ-1C Gray Eagle deliveries are expected to end in 2022, at which point production of the ZPY-1 STARLite is expected to end

**Unit Production Forecast
2022-2031**



Orientation

Description. The ZPY-1 STARLite is a synthetic aperture radar (SAR) with ground moving target indicator (GMTI) and dismount moving target indicator (DMTI) capability. It is designed to equip medium and lightweight unmanned aerial vehicles (UAVs).

Sponsor. Northrop Grumman developed the radar for the U.S. Army.

Status. In production; fully mature.

Application. The STARLite radar is designed for medium- and lightweight UAVs, such as its primary platform, the MQ-1C Gray Eagle. Other possible platforms include light fixed-wing aircraft and manned helicopters. The system has been integrated on board the PTDS aerostat and the RQ-7 Shadow UAV.

Price Range. Based on initial contracts for the STARLite radar, the estimated price of a single unit began at \$3.1 million. By 2015, the estimated price of a single unit had fallen to \$2.3 million. As of the U.S. Army's FY19 budget release, the average price of a new ZPY-1 STARLite over its production run was \$1.7 million.

U.S. FY15 budget documents indicate that STARLite installation hardware (A-kit) had an average price of \$817,954.

Contractors

Prime

**Northrop Grumman
Mission Systems**

<http://www.northropgrumman.com>, 7323 Aviation Blvd, Baltimore, MD 21240-2001
United States, Tel: + 1 (410) 765-1000, Email: ES_Communications@ngc.com, Prime

ZPY-1 STARLite**Subcontractor**

**General Atomics
Aeronautical Systems Inc**

<http://www.ga-asi.com>, 16761 Via Del Campo Ct, San Diego, CA 92127-1713
United States, Tel: + 1 (858) 312-2810, Fax: + 1 (858) 312-4247,
Email: wegerb@gat.com (ZPY-1 STARLite Sensor CE Software Development)

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

Technical Data

	<u>Metric</u>	<u>U.S.</u>
Weight	29.5 kg	65 lb
Volume	0.034 cu m	1.2 cu ft
Power Requirements	<750 W	

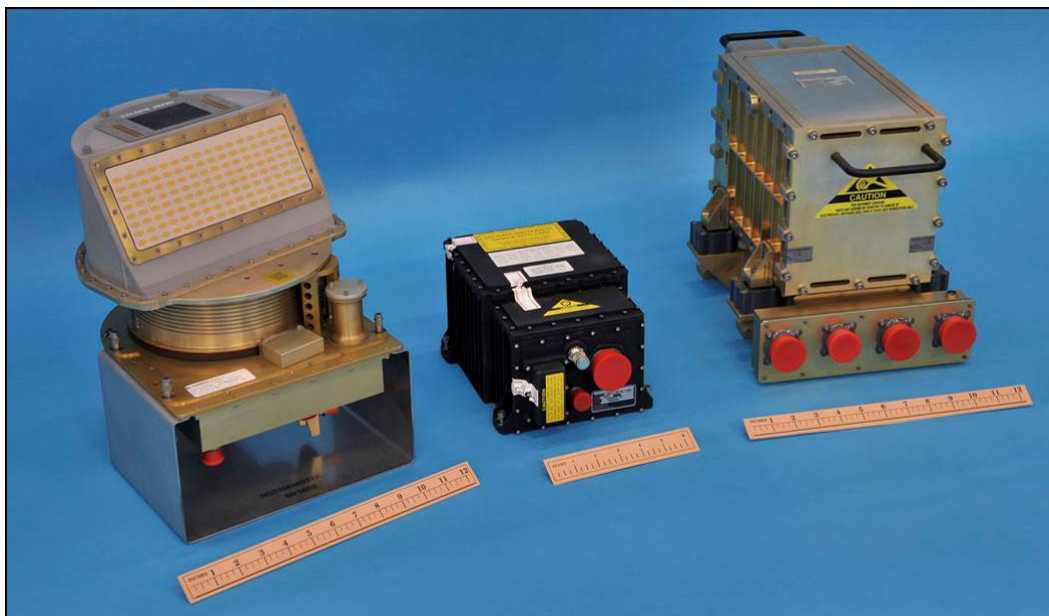
Design Features. STARLite is a lightweight synthetic aperture radar (SAR) with ground moving target indicator (GMTI) capability. The STARLite radar is an electronically scanned array system that blends electronic scanning with mechanical array positioning. It features wide-area search capabilities and a built-in imaging mode that provides all-weather surveillance, day or night. The radar can operate through battlefield obscurants and utilizes commercially supported electronics.

STARLite provides two SAR modes: Strip and Spot. In Strip mode, the radar imagery is either parallel to the aircraft flight vector or along a specified ground path,

which is independent of the aircraft's flight path. In Spot mode, the radar produces a high-resolution image at a specific geographic patch.

In GMTI mode, STARLite provides moving target locations overlaid on a digital map. The Maritime Moving Target Indicator (MMTI) mode, which is in development, will provide a similar function for targets that are over water.

STARLite is designed to be compatible with standard ground control stations such as the U.S. Army One Common Ground Station. Platforms can include light- and medium-weight UAVs, light fixed-wing platforms, and manned helicopters.



ZPY-1 STARLite Equipment

Source: Northrop Grumman

ZPY-1 STARLite

Program Review

Background. In August 2005, General Atomics won the U.S. Army contract to develop a platform for the Extended Range, Multi-Purpose (ERMP) UAV system. General Atomics proposed a variant of its Predator UAS: the Sky Warrior.

The Sky Warrior will replace RQ-5 Hunter UAVs. Hunters were sent to Iraq and Afghanistan without radar to accommodate larger weapons loads. However, the Army is determined to include a radar as part of the ERMP's sensor payload. Synthetic aperture radar provides all-weather imaging and surveillance capability. Advances in technology have allowed new SARs to be smaller and lighter than older radars.

Lynx Out, STARLite In

The U.S. Army refers to the MQ-1C Sky Warrior as the "Gray Eagle," and the Army initially planned to equip the Gray Eagles with the General Atomics Lynx radar. However, technical and cost issues associated with the Lynx radar forced the Army to find another solution.

The Army selected the STARLite radar to equip the UAV in April 2008 following an extensive competition. Under the terms of the initial contract, Northrop Grumman was awarded \$42 million to deliver 10 production units. The amount was later increased to \$47 million, including five additional units. Deliveries were expected to be completed by the middle of 2009. In October 2008, the U.S. Army indicated that the program was progressing on schedule.

Spiral Development Strategy

By December 2008 it had become apparent that the Sky Warrior UAV would be ready for deployment before the radar. Tim Owings, the U.S. Army's UAS deputy program manager, said that due to the delay in the development program, the STARLite radar was still in the prototype stage.

According to Owings, the Army intended to purchase Sky Warrior UAVs using a spiral development strategy. As part of this strategy, early versions of the aircraft would be deployed without the radar in an attempt to get them to the battlefield sooner. Future warriors would be equipped with the radar when it became available. John Young, former Under Secretary of Defense for Acquisition, Technology, and Logistics at the Department of Defense, approved this plan in February 2009.

U.S. Army Fire Scouts Canceled

The STARLite radar had also been selected to equip U.S. Army MQ-8 Fire Scout UAVs. The Northrop

Grumman Fire Scout was part of the U.S. Army's Future Combat Systems (FCS) program. The U.S. Army ended the FCS modernization effort in April 2009, and the Army canceled its Fire Scout orders.

Two Radars Delivered, New Contract, Testing

In February 2010, Northrop Grumman delivered the first two production ZPY-1 STARLite radars to the U.S. Army. Northrop Grumman stated that the work was being done under a \$78.5 million contract with the U.S. Army Robotics and Unmanned Sensors Project Office at Aberdeen Proving Ground to provide 33 STARLite radar systems by April 2011.

Northrop Grumman reported that deliveries were made after the completion of reliability testing and 1,200 hours of operational and environmental qualification testing. Independent performance verification tests were conducted by the Army's Test and Evaluation Center at Yuma Proving Ground in Arizona.

In November 2010, the U.S. Army exercised a contract option for 40 additional STARLite radars, to be delivered between March 2011 and March 2012. The radars were part of the ERMP UAV program.

During the U.S. Joint Forces Command's Empire Challenge 2011, a STARLite radar was successfully demonstrated aboard a Northrop Grumman Firebird optionally manned aircraft. The first operational test of the STARLite proved its ability to provide GMTI data and SAR imagery to ground forces in real time through the Tactical Common Data Link (TCDL). Additionally, the STARLite's developmental DMTI was demonstrated for the first time aboard a moving platform during a joint exercise. Two STARLite configurations were in operation during Empire Challenge: a baseline system and a model with an extended-range antenna capable of doubling the radar's range.

Aerostat: A New Platform

In March 2011, the U.S. Army placed an order for 10 STARLite systems in support of Operation Enduring Freedom. An examination of concurrent reports, the crosschecking of other systems mentioned, and statements by the contract awardee (Lockheed Martin Mission Systems and Sensors) indicated that these STARLite radars would be deployed on board Persistent Threat Detection System (PTDS) aerostats. For operational use, the radars were modified with a software update to provide DMTI of individuals.

ZPY-1 STARLite

By the end of May 2011, the Army had followed on the earlier award with a procurement of 29 PTDSs, all to be delivered by the end of May 2012. It is assumed that the STARLite was installed on the entire production run of these aerostats, an assumption that was corroborated by a September 2012 release from Northrop Grumman indicating that 174 STARLite systems had been ordered.

Northrop Grumman released an update on the aerostat project with an announcement that the first STARLite-equipped PTDS had been operationally deployed in October 2011.

FY12/FY13 Budget and Testing News

In the FY13 U.S. Army budget, the STARLite was dropped from RDT&E funding and now existed fully as a procurement item. The MQ-1C Gray Eagle's radar was moved into full-rate production (FRP), its design considered mature.

During FY12, final integration of the STARLite ER (Extended Range) was performed aboard the Gray Eagle. The Gray Eagle's initial operational test and evaluation (IOT&E) was conducted from July 30 through August 17, 2012, at Edwards Air Force Base. Following the testing, the Director, Operational Test & Evaluation (DOT&E) completed a BLRIP (beyond low-rate initial production) report supporting the Gray Eagle's FRP ahead of a final decision, scheduled for April 2013. Follow-on operational test and evaluation (FOT&E) was expected to be conducted in the fourth quarter of FY13, and Initial Operational Capability (IOC) was expected in the first quarter of FY14.

The U.S. Army FY13 budget called for the acquisition of only 107 Gray Eagle units. At one time, the U.S. Army intended to procure at least 168, so the final acquisition number could rise yet again. The production forecast was expected to become clearer following the Gray Eagle's FOT&E.



The ZPY-1 STARLite flew on board a Northrop Grumman experimental platform.

Source: Northrop Grumman

Funding

The ZPY-1 STARLite received U.S. Army funding through FY19. As of the release of the FY21 budget estimates, no further itemized funding has been allocated.

ZPY-1 STARLite**Contracts/Orders & Options**

<u>Contractor</u>	<u>Award (\$ millions)</u>	<u>Date/Description</u>
Northrop Grumman	42	Apr 2008 – Firm-fixed-price (FFP) contract for SAR/GMTI. Work was expected to be completed in Apr 2013. Northrop Grumman disclosed that under the terms of this contract, the company would deliver 10 STARLite radars. Northrop Grumman later stated that the award was worth \$47 million and included delivery of 15 STARLite radars. (W15P7T-08-C-P427)
Northrop Grumman	9.5	Aug 2009 – FFP contract for the Electromagnetic Imaging/Interface Control Document engineering change proposal for a required design change to the SAR/GMTI STARLite system. Work was completed May 2010. CECOM Acquisition Center, Fort Monmouth, NJ, was the contracting activity. (W15P7T-08-C-P427)
Lockheed Martin Mission Systems and Sensors	85.3	Mar 2011 – FFP contract for the procurement of 42 MX-20 Lite sensor B-kits, 21 MX-20 Lite installation A-kits, five ground control stations, and 10 STARLite installation A-kits in support of Operation Enduring Freedom. (W15P7T-11-C-S002)
Northrop Grumman	85.3	Sep 2013 – CPFF, non-option-eligible, multiyear indefinite delivery/indefinite quantity contract to provide STARLite SAR/GMTI system support. (W15P7T-13-D-C118)
Northrop Grumman Systems	40.691	Apr 2014 – FFP multiyear contract to provide 94 STARLite SAR/GMTI systems for the U.S. Army. The contract's estimated completion date was Apr 2017. (W15P7T-14-C-C005)
Northrop Grumman Systems	86.200	Jan 2019 – Hybrid CPFF and FFP contract for STARLite system support. Work is expected to be completed by Jan 31, 2023. (W56KGY-19-D-002)
Northrop Grumman Systems	52.634	Mar 2020 – CPFF contract to provide inspection, testing, and support services for tactical radar systems, including supply chain management and quality assurance. Work is expected to be completed Mar 30, 2025. (W56JSR-20-D-0006)

Worldwide Distribution/Inventories

As of April 2022, this is a U.S.-only program.

Forecast Rationale

Northrop Grumman's ZPY-1 STARLite was designed to provide UAVs and light aircraft with synthetic aperture radar (SAR) and moving target indicator (MTI) functionality in a lightweight package. As part of the MTI functionality, the STARLite can function in Dismount Moving Target Indicator (DMTI), Ground Moving Target Indicator (GMTI), and Maritime Moving Target Indicator (MMTI) modes. The system is primarily used on board U.S. Army MQ-1C Gray Eagle UAVs and Persistent Threat Detection System (PTDS) aerostats.

The U.S. Army concluded STARLite developmental funding in FY19. The system is considered fully mature.

The U.S. Army's ZPY-1 requirements will extend production to 2022, concurrent with the delivery of the service's final MQ-1C. The radar is forecast on a one-for-one basis with the UAV, but replacement ZPY-1s were procured in the past for active aircraft.

ZPY-1 STARLite

Saudi Arabia was approved for 10 PTDS aerostats equipped with STARLite in 2017. The potential order would have expanded the radar's customer base. However, a May 2019 Request for Information for another aerostat, the PSS-T, specified the Raven Aerostar Vista SSRS-F25 radar. In May 2020, Saudi Arabia formally awarded aerostat production company TCOM an initial contract for the PSS-T equipped with the Vista SSRS-F25, abandoning the potential PTDS procurement.

In a development that had the potential to impede future STARLite support earnings, in 2019, MQ-1C

manufacturer General Atomics began internal testing of new sensor payloads on board a Gray Eagle Extended Range model. One of the sensors tested was GA-ASI's Lynx Block 30A radar, which serves missions similar to those performed by the ZPY-1 STARLite but has been developed beyond the capabilities of the Northrop Grumman unit.

Forecast International anticipates STARLite production to fill the remaining U.S. Army MQ-1C Gray Eagle requirement. Beyond the Army requirement, no further ZPY-1 procurement is expected.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR UNIT PRODUCTION												
Designation or Program		High Confidence				Good Confidence			Speculative			
	Thru 2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	Total
Northrop Grumman Mission Systems												
ZPY-1 STARLite <> United States <> Army <> Gray Eagle												
Note: Forecast Includes Replacement Units												
	263	19	0	0	0	0	0	0	0	0	0	19
Total	263	19	0	0	0	0	0	0	0	0	0	19