ARCHIVED REPORT

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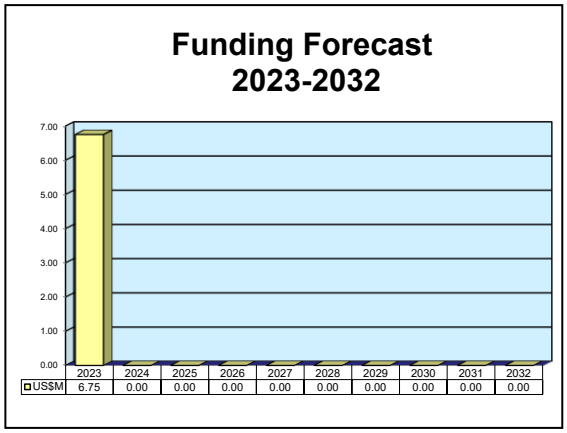
ZPY-2 MP-RTIP

Outlook

- ZPY-2 MP-RTIP production has ended
- Increased international interest in the MP-RTIP may come via the NATO AGS program, but further procurement is highly unlikely
- If no further program activity emerges, this report will be archived next year



Orientation

Description. This program is the result of the restructuring of the Joint Surveillance Target Attack Radar System (JSTARS) Radar Technology Insertion Program (RTIP) into the Multi-Platform Radar Technology Insertion Program (MP-RTIP). RTIP was originally a preplanned product improvement (P3I) for JSTARS, but grew into a more significant development.

The ZPY-2 is the result of work to optimize the MP-RTIP for application on unmanned air vehicles (UAVs).

Sponsor

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Status. Active, but in continued development.

Application. The U.S. Air Force and NATO have equipped Global Hawk Block 40 UAVs with the ZPY-2. At one time, the radar was planned for the U.S. Air Force's JSTARS recapitalization.

Price. ZPY-2 MP-RTIP units for the Global Hawk Block 40 are estimated to cost around $4 million. The canceled, scaled-up version for the JSTARS Recap was likely to cost between $20 million and $28 million.

Contractors

Prime

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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

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Technical Data

The Global Hawk Block 40-based NATO AGS UAV features the ZPY-2 MP-RTIP.

Source: Northrop Grumman

Design Features. The Multi-Platform Radar Technology Insertion Program provides warfighters with a modular, scalable, two-dimensional active electronically scanned array (AESA) radar with enhanced wide-area surveillance (WAS) capabilities. The radar operates in the X-band. The program began as an upgrade to the Joint Surveillance Target Attack Radar System (JSTARS) on the E-8C. The design progressed into a unique system.

The USAF later decided to make the radar a scalable sensor for multiple platforms, including a new E-10 MC2A aircraft that would replace the E-8C and the Global Hawk UAV. The Air Force has since canceled the E-10 MC2A, leaving the Global Hawk Block 40 as the only platform certain to receive the MP-RTIP. In its UAV-optimized variant, the MP-RTIP is known as the ZPY-2.

The MP-RTIP consists of three architectural elements: the antenna, the radio frequency electronics, and the signal processor. These elements allow for common interface definitions across the various host platforms. The radar's software can function independently of the physical location of the hardware that it is controlling. The software architecture is also host-platform-independent to the maximum extent possible. A Radar Operating Services application was codeveloped by Northrop Grumman and Raytheon in order to provide a common interface between the common mode software and hardware components.

In October 2003, Milestone B was approved and the program was authorized for entry into the System Development and Demonstration (SDD) phase, with the provision that the Air Force fund the program to the Cost Analysis Improvement Group estimate as revised in 2004.

Operational Characteristics. Formerly a P3I for JSTARS, the MP-RTIP delivers a significantly enhanced wide-area surveillance capability. It has a WAS platform to provide a near real-time, horizontally integrated view of the air and surface battlespace. To achieve this goal, sensors, network-centric warfare systems, and high-speed wideband communications are incorporated onto the platform.

Variants/Upgrades

E-10 MC2A. The MP-RTIP was designed to be the primary sensor of the E-10 MC2A, which was planned to replace the E-8C JSTARS. The E-10's variant was expected to measure 4 x 21 feet, making it larger and more capable than the system on the Global Hawk. In the FY08 budget, the USAF canceled the E-10 and its MP-RTIP variant.

As of the USAF's FY15 budget, the E-10's MP-RTIP component endured as a developmental objective in the Sensor Systems portion of the U.S. Air Force's NextGen JSTARS recapitalization effort. However, as a result of the Air Force's cancellation of the JSTARS Recap program, from the FY19 budget requests forward there was no allocation for JSTARS-related MP-RTIP development.

ZPY-2 / Global Hawk Block 40. The MP-RTIP designed for the Global Hawk measures 1.5 x 4 feet, making it smaller than the variant developed for the E-10 MC2A. In this guise, the MP-RTIP is known as the ZPY-2.

The ZPY-2 has an approximate range of 200 kilometers (108 nm).

Program Review

MP-RTIP Began as JSTARS Upgrade

In the late 1990s, the U.S. Air Force began a program to upgrade its APY-3 Joint Surveillance and Target Attack Radar System (JSTARS); it was called the Radar Technology Insertion Program (RTIP). In 1999, the USAF awarded a pre-engineering and manufacturing development contract to Northrop Grumman worth $15 million to begin work on the RTIP.

Following a radar sensor study, the USAF decided to expand the RTIP effort. In 2000, the Air Force changed RTIP from a JSTARS upgrade to a development program to design a modular, scalable radar for multiple platforms. The radar would have synthetic aperture radar and moving target indicator capability. The program was renamed the Multi-Platform Radar Technology Insertion Program (MP-RTIP). In December 2000, the Air Force awarded a $303 million contract to a Northrop Grumman-Raytheon team to develop the new radar. The first phase of the program used simulation and prototyping to develop the new sensor.

Under the USAF's plan, the MP-RTIP sensor would equip a manned and an unmanned platform. The manned platform would carry a larger, more capable version of the radar, while the unmanned platform would carry a smaller version of the system. The Air Force decided to use a militarized Boeing 767 for the manned platform and a Global Hawk unmanned aerial system (UAS) for the unmanned platform. The USAF wanted six MP-RTIP-equipped E-10s and 12 MP-RTIP-equipped Global Hawks. The Global Hawk MP-RTIP variant eventually gained the AN designation ZPY-2.

Throughout MP-RTIP development, the program was threatened by budget cuts. The USAF, along with the rest of the U.S. Department of Defense, was gearing up for the long struggle against international terrorists following the September 11, 2001, attacks. Consequently, any increases in spending went to fighting terrorism. The MP-RTIP, along with the E-10 MC2A aircraft intended as its platform, emerged at the top of the list of programs to cut. But, despite its high price, the program continued to be funded for more than half a decade.

Go-Ahead in 2003

In December 2003, the U.S. DoD gave the go-ahead for the MP-RTIP, allowing the Air Force to pursue an SDD contract. In April 2004, Northrop Grumman was awarded an $888 million SDD contract, which covered program design, development, production, testing, and certification. It called for two low-rate initial production units for the E-10 and three LRIP units for the Global Hawk.

The program reached a major milestone in July 2004 when an MP-RTIP sensor prototype successfully completed ground-based testing. The flight tests of an MP-RTIP sensor began in October 2006. The radar was carried in a pod on a Proteus test aircraft. The Proteus is a high-altitude aircraft that can be controlled by a pilot flying the aircraft or by remote control, much like an unmanned vehicle.

JSTARS Upgrade, Again MP-RTIP?

The USAF canceled funding for the E-10 airframe program and the MP-RTIP sensor for that aircraft in the FY08 budget. However, the larger version of the MP-RTIP sensor endured for a potential new life. The USAF said that it still needed the capabilities that the system provides, particularly its ability to detect low-flying cruise missiles. Congress also indicated that it

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favored the program. Based on statements from Congress and the Air Force, the most likely solution was to replace the JSTARS on in-service E-8C aircraft.

In May 2008, the Senate Armed Forces Committee added $98 million to the JSTARS program to study the effects of putting the MP-RTIP sensor on an E-8C. In November 2008, Northrop Grumman announced that it had been awarded $5.8 million for risk reduction efforts involving placing the radar on the E-8.

In April 2008, the USAF awarded Northrop Grumman a $79.4 million contract for the production of MP-RTIP sensors. An initial $33.9 million was obligated to begin procurement of three systems. The radar would be tested under various conditions, and production would be delayed until testing was completed.

Testing and Challenges

Following a successful test-readiness review, the U.S. DoD gave Northrop Grumman permission to begin the Radar System Level Performance Verification (RSLPV) process. In May 2009, Northrop Grumman completed dedicated mode flights under the RSLPV program. According to an article that appeared in *Aviation Week* in November 2009, another challenge for engineers was the MP-RTIP High-Range Resolution (HRR) mode. This new mode would provide electrical measurements of ground length, needed to improve target tracking and identification. As of November 2009, some flight-testing of the HRR mode had taken place.

Meanwhile, *Aviation Week* estimated that the MP-RTIP would complete flight tests on a Global Hawk in mid-2010. The second development unit, DU-2, would be the first sensor to go on the UAV. DU-1 would be used for testing on Proteus and to develop maritime modes.

According to a report in *Inside the Air Force* (July 2009), the USAF FY10 budget proposal included a $23 million request specifically for MP-RTIP development. The report also stated that the Senate Armed Services Committee had recommended a $92 million increase to the budget request to continue MP-RTIP development for the E-8C aircraft. House lawmakers only approved the $23 million request.

Aviation Week reported in September 2009 that the Global Hawk Block 40 was facing budget challenges, with the House suggesting cutting one year of production from the program. Planners also looked at delaying the project in order to save money.

In September 2009, participating nations signed the AGS Program Memorandum of Understanding. This led to the establishment of the NATO Alliance Ground Surveillance Management Agency (NAGSMA), which would be responsible for procurement of the NATO AGS capability until it reached Full Operational Capability.

Northrop Grumman delivered the first production MP-RTIP sensor to the Air Force for mounting on a Block 40 Global Hawk in December 2010. The first MP-RTIP Global Hawk flight occurred in July 2011, and reports began to refer to the radar with the ZPY-2 A/N designation.

Maritime Mode

Aviation Week reported in November 2009 that a developmental MP-RTIP sensor would be used for testing new maritime modes for the NATO AGS requirement in 2010. The report said that these tests could lead to a U.S. requirement for the new modes. In July 2010, Northrop Grumman was awarded a $5.5 million contract modification to support the development of software to test maritime surveillance and maritime imaging modes for the MP-RTIP radar.

As of April 2019, maritime mode development continued, with implementation on board the NATO AGS platform not expected until FY21.

2011 & 2012: DOT&E Report on Global Hawk Block 40 and ZPY-2 MP-RTIP

During 2011, RQ-4B Global Hawk Block 40 and ZPY-2 integration efforts progressed rapidly. As a result, the UAV began flight-testing with the radar aboard.

However, the U.S. Director, Operational Test & Evaluation raised questions about the Block 40's future in an FY11 report. The DOT&E stated that the test schedule was at risk due to budget constraints and the declining importance of the Block 40 relative to Block 30 testing activities. With the USAF shifting priorities to the Block 30 over development of the Block 40, the latter's testing capacity was reduced by about 30 percent. As a result, the Block 40 initial operational test and evaluation (IOT&E) date was pushed back a year – from late FY13 to FY14.

Because of the decrease in Block 40 testing capability, development of several of the ZPY-2's operating modes – High-Range Resolution, Airborne Moving Target Indicator, and Maritime Moving Target Indicator – was postponed indefinitely. Still, the DOT&E report recommended that development of the Block 40 and its radar's final operational requirements be completed.

For 2012's development efforts, the DOT&E reported successful initial phase testing of the Block 40 and ZPY-2. System-level performance verification testing

was completed in July 2012, demonstrating basic integration of radar and platform.

Displaying the military's growing confidence in the system, the test schedule was altered to allow for the in-field deployment of two developmental systems for U.S. Central Command (USCENTCOM) in May 2013. In a supporting measure, the delivery schedule for the UAVs was accelerated so that at least nine of the 11 procured aircraft would arrive prior to IOT&E and Initial Operational Capability (IOC).

2013: DOT&E Update on the RQ-4B Block 40 and ZPY-2 MP-RTIP

The DOT&E provided an assessment of the platform and its ZPY-2 system in August 2013, ahead of the USCENTCOM's early fielding of the RQ-4B Block 40. The report concluded that while the system's early operational capabilities were limited, they would be sufficient to provide the additional near real-time ground moving target capabilities required by USCENTCOM. Two RQ-4B Block 40 systems equipped with ZPY-2 radars were deployed to the USCENTCOM operating area in September 2013.

USCENTCOM found that the ZPY-2's synthetic aperture radar (SAR) stationary target imagery capabilities were immature, as were its operator displays, which significantly increased workload during target-intense operations.

Frequent ZPY-2 sensor faults required operators to halt activities in order to reset or restart the system. This caused on-station intelligence collection to be reduced by 23 percent. In its mature form, the ZPY-2 was required to achieve 90 percent availability, far greater than the 77 percent availability displayed.

Additional performance and interoperability testing continued through 2014. Testing in 2015 assured the system would be functional when IOT&E concluded in 1Q FY16. Radar development build efforts that began in 1Q FY17 were expected to continue throughout the life of the radar.

Funding

U.S. FUNDING

	Prior AMT	FY20 AMT	FY21 AMT	FY22 AMT	FY23 AMT	FY24 AMT	FY25 AMT	FY26 AMT
RDT&E (U.S. Air Force)					-	-	-	-
PE#0305220F – RQ-4 UAV								
67RTIP – MP-RTIP	244.794	0.500	0.000	0.000	0.000	0.000	0.000	0.000
PE#0305238F – NATO AGS								
676001 – NATO AGS	N/A	32.567	36.664	19.473	N/A	N/A	N/A	N/A
Design/Development of Maritime Modes	N/A	24.682	23.463	13.261	N/A	N/A	N/A	N/A

N/A = Not Available

Notes: In FY15, funding for the MP-RTIP portion of the JSTARS recapitalization was moved from PE#0604283F to PE#0307581F.

All $ are in millions.

Source: U.S. Department of the Air Force, FY22 Budget Estimates, RDT&E, Air Force, Vol. 3, Pt. 2, BA 7, May 2021.

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Contracts/Orders & Options

(Contracts over $5 million)

Contractor	Award ($ millions)	Date/Description
Northrop Grumman	10	Apr 2008 – Lot 8 advance purchase of items for two Block R-4 vehicles, three Block 40 vehicles, four MP-RTIP sensors, and other equipment. (FA8620-08-C-3001)
Northrop Grumman	324.6	Jul 2008 – Mod to an FFP to provide two RQ-4B vehicles and three RQ-4B vehicles with the MP-RTIP sensor. (FA8620-07-C-4015, P00008)
Northrop Grumman	5.8	Nov 2008 – Cost-reimbursement-with-award-fee contract mod. This action provides for JSTARS modernization and a risk reduction effort to study the feasibility of an MP-RTIP sensor on the JSTARS platform. (F19629-00-C-0100, P00153)
Northrop Grumman	21.6	Apr 2009 – Fixed-price-incentive contract for advance procurement of LRIP Lot 9 selected long-lead items required to meet the production schedule of two Global Hawk Block 30 and three Global Hawk Block 40 air vehicles, plus selected long-lead items for the Airborne Signals Intelligence Payload (ASIP) sensors. (FA8620-09-C-4001)
Northrop Grumman	75.2	Jun 2009 – Fixed-price-incentive contract to provide long-lead funding for two Global Hawk Block 30M air vehicles, each including ASIP and Enhanced Integrated Sensor Suite (EISS) payloads, and three Global Hawk 40 vehicles, each including an MP-RTIP payload and three ASIP retrofit kits. (FA8620-09-C-4001)
Northrop Grumman	57.1	Aug 2009 – Contract mod to provide a demonstration unit of the initial parts of the MP-RTIP sensor for the JSTARS E-8 platform. (F19628-00-C-0100, P00174)
Northrop Grumman	30	May 2010 – Contract for congressionally mandated advance procurement of long-lead items associated with two Block 30 and two Block 40 Global Hawks, two in-line ASIPs, two MP-RTIP sensors, two in-line sensors, and other items and activities required to protect the Lot 10 production schedule. (FA8620-10-C-4000)
Northrop Grumman	5.5	Jul 2010 – Contract mod for development of software to test maritime surveillance and imaging modes for the MP-RTIP radar. (F19628-00-C-0100, P00209)
Northrop Grumman	12.3	Sep 2010 – Contract mod to provide MP-RTIP development and demonstration toward integration with the Global Hawk Block 40 program. (F19628-00-C-0100, P00220)
Northrop Grumman	7.29	Dec 2010 – Contract to provide for MP-RTIP development and demonstration for integration with the Global Hawk Block 40 program. (F19628-00-C-0100)
Northrop Grumman	46.0	Jan 2011 – Contract mod for the advance procurement of long-lead items associated with two Block 30 and two Block 40 Global Hawks, two in-line ASIPs, two MP-RTIP sensors, two in-line EISS sensors, and other items and activities required to protect the Lot 10 production schedule. (FA8620-10-C-4000, P00002)

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Contractor	Award ($ millions)	Date/Description
Northrop Grumman	7.15	Jun 2011 – Fixed-price-incentive contract mod for the advance procurement of long-lead items for two Block 30 and two Block 40 Global Hawks, two in-line ASIPs, two MP-RTIP sensors, two in-line EISS sensors, and other items and activities. (FA8620-10-C-4000, P00006)
Northrop Grumman	12.27	Nov 2011 – Cost-plus-award-fee contract mod for development and demonstration of the MP-RTIP sensor toward integration with the Block 40 Global Hawk. (F19628-00-C-0100, P00242)
Northrop Grumman	24.48	Mar 2012 – Cost-plus-fixed-fee contract for development and demonstration of the MP-RTIP sensor to align with the Global Hawk Block 40 program schedule. Work was completed Aug 2013. (F19628-00-C-0100, P00213)
Northrop Grumman	51.28	May 2012 – Cost-plus-incentive-fee contract for MP-RTIP SDD for Global Hawk Block 40. Work was to be completed by Mar 2015. (F19628-00-C-0100, P00233)
Northrop Grumman	10.71	Sep 2012 – Contract mod for MP-RTIP SDD schedule extension. Work was completed by Jan 31, 2014. (F19628-00-C-0100, P00243)
Northrop Grumman	28.61	Sep 2013 – Mod to a previously awarded contract for the completion of maritime mode development for the MP-RTIP. The cumulative value of the contract following this action was $1,514.5 million. Work was completed by May 2015. (F19628-00-C-0100)
Northrop Grumman, Aerospace Systems	6.568	Apr 2014 – Modification P00264 to a previously awarded contract to provide a schedule extension for radar SDD for the MP-RTIP system. The contract aligns the radar's development schedule with the Global Hawk Block 40's. Work was completed in Aug 2014. (F19628-00C-0100)
Northrop Grumman, Aerospace Systems	17.059	Jul 2014 – Modification P00270 to a previously awarded CPFF contract for radar software deficiency corrections related to the MP-RTIP. The cumulative value of the contract at time of award was $1.53 billion. Work was completed in Sep 2015. (F19628-00-C-0100)
Northrop Grumman, Aerospace Systems	18.000	Jul 2014 – FFP modification P00257 to a previously awarded contract for modification of the MP-RTIP radar. The cumulative value of the contract at time of award was $1.558 billion. Work was expected to be completed in Mar 2017. (F19628-00-C-0100)
Northrop Grumman, Aerospace Systems	10.000	Aug 2015 – FFP delivery order against a previously awarded General Services Administration Schedule (GS-23F-0058K) for pre-engineering and manufacturing development for the JSTARS Recapitalization program. Northrop Grumman would help assess the maturity of subsystem technology, reduce weapon system integration risk, and lower life-cycle cost by virtue of design. Work was expected to be completed by Jul 2016. (FA8730-15-F0053)
Northrop Grumman Systems	70.288	Mar 2016 – A not-to-exceed, undefinitized contract for radar risk-reduction efforts intended for the JSTARS Recapitalization program. Under the contract, Northrop Grumman was to provide nonrecurring hardware and software engineering activities, ensuring that radars would be scaled to meet JSTARS Recap WAS requirements. Work was to be completed by the end of Sep 2017. (FA8730-16-C-0016)
Northrop Grumman Systems	4.337	Aug 2016 – JSTARS Recap Radar contract action definitization. (FA8730-16-C-0016-PZ-0001)

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Contractor	Award ($ millions)	Date/Description
Northrop Grumman Systems	12.080	Jul 2022 – On behalf of an FMS to NATO, an FFP modification (P00027) to a previously awarded contract for sustainment of MP-RTIP and Integrated Mission Management Computer maintenance and repair. Work was expected to be completed by Sep 30, 2022. (FA8620-19-C-1001)
Northrop Grumman Systems	13.006	Sep 2022 – CPFF contract for the development, implementation, testing, and sustainment of MP-RTIP and Integrated Mission Management Computer maintenance and repair under a NATO FMS. Work is expected to be completed by Sep 30, 2023. (FA8690-22-C-1000)

Worldwide Distribution/Inventories

This is a **U.S.** and **NATO** program. Select countries that are highly aligned with U.S. and NATO interests are potential customers.

Forecast Rationale

ZPY-2 MP-RTIP radar funding will continue in the short term. During its history, the program has struggled with developmental delays and operational deficiencies, but the radar is now airborne, flying on board the RQ-4 Block 40 and NATO AGS UAVs.

In recent years, RDT&E funding has been allocated to add a maritime mode to the ZPY-2. NATO AGS Global Hawk models will receive this enhancement, but at this time it is unknown if the U.S. Air Force will undertake the retrofit.

ZPY-2 MP-RTIP production associated with the NATO AGS platform has ended, but additional international markets may open.

Bear in mind, though, that any new customers are unlikely. If a customer outside the U.S. begins operation of the radar, it will be with a country that has extremely close ties to both the U.S. and NATO. A highly speculative example for this scenario would be a country like Australia.

For now, only MP-RTIP RDT&E funding is forecast, and only through 2023.

Previously, it appeared as if the MP-RTIP in a scaled-up guise might fly on board the JSTARS Recap aircraft.

MP-RTIP program development began under the U.S. Air Force's E-10 project, a JSTARS replacement effort; it was then folded into a broader NextGen JSTARS recapitalization plan. Even though the original host platform had been canceled, the MP-RTIP radar development begun for the JSTARS' planned successor was to be applied to the next generation of JSTARS aircraft.

Northrop Grumman received an initial risk reduction contract for JSTARS Recap radar development in August 2015. Two follow-on contracts in March 2016 would see Raytheon compete with Northrop Grumman for the JSTARS Recap radar award.

However, the U.S. Air Force's FY19 budget estimates revealed that almost all funding requested for the JSTARS Recap had been removed. As of 2020, the JSTARS Recap was "dead in the water," and consequently, no related MP-RTIP production or funding has been included in the forecast since.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR RDT&E FUNDING (in millions US$)												
Designation or Program		High Confidence				Good Confidence			Speculative			
	Thru 2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	Total
Northrop Grumman Aerospace Systems												
ZPY-2/MP-RTIP <> United States <> Air Force Note: Radar development only; RQ-4B Block 40 and JSTARS platform development not included												
	1383.32	6.75	.00	.00	.00	.00	.00	.00	.00	.00	.00	6.75
Total	1,383.32	6.75	.00	.00	.00	.00	.00	.00	.00	.00	.00	6.75