

Lockheed Martin: Leading in Next-Gen Radar Technology



As a leader in next-generation radar technology, Lockheed Martin is ensuring warfighters have the leap-ahead situational awareness capabilities required for true protection against the full array of evolving battlefield challenges with precision, adaptability and reliability.

The company has established a legacy with producing high-performing solid-state radars required for integrated air and missile defense, long range surveillance, early warning and counter-target acquisition. With their two newest ground based mobile radars, the Sentinel A4 and TPY-4, Lockheed Martin is delivering advanced radar capabilities primed for continued protection throughout the future fight.

The Sentinel A4, the fully digital, revolutionary leap from the U.S. Army's legacy Sentinel A3 radar, will provide significant improvements to counter cruise missiles, unmanned aerial systems, rotary wing and fixed wing threats, offering high availability, flexible mission performance, growth potential and ease of integration. TPY-4, selected as the next-generation long-range radar for both the U.S. Air Force and Norwegian Royal Air Force, is offering transformational change in the ability to track and identify complex threats at greater distances in challenging environments.

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“Lockheed Martin has a really rich history of providing cutting-edge radar systems going back at least 60 years, if not more,” said Michael Walsh, the company’s chief engineer for radar and sensor systems. “The Sentinel A4 and TPY-4 build on that proud history.”

Development of the Sentinel A4 and TPY-4 radars has been driven by a commitment to open architecture principles to aid customers’ ease in integration and upgradeability. These open systems facilitate seamless integration with third-party command and control systems. Lockheed Martin also fosters a “product line” approach for hardware and software commonality to drive down costs and improve sustainment.

Lockheed Martin has fielded advanced radar systems over the last 60 years to more than 45 countries across six continents, leveraging its decades of performance, design enhancements and end user feedback to drive the development of future capabilities. This includes the highly-mobile ground-based Q-53 radar the company has been delivering to the Army over the last 15 years.

“Q-53 showed us how to go fast. We leveraged a lot of the lessons learned from that development and applied it to how we did business for these new radars,” Walsh said, noting the first Q-53 was delivered to the Army just over 30 months after contract award.

Now, with Sentinel A4, the Army will have its most capable medium-range air defense radar, designed to operate in the most challenging environments while providing the adaptability and flexibility to support uninterrupted execution of the mission.

Since receiving the Sentinel A4 contract in September 2019, Lockheed Martin has already delivered the first five radars to the Army and the service placed an order for 19 more after successful testing. Walsh cited the delivery timeline as an example of replicating the success with fielding the Q-53 radar at “light speed.”

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— Michael Walsh



In addition to Sentinel A4's role protecting warfighters in combat, the new radar has also been selected to protect the National Capital Region (NCR) and to support the defense of Guam mission. The new radar's integration with the NASAMS for the NCR air and missile defense capability will provide critical security to vital strategic assets.

Utilizing the latest in gallium nitride, or GaN, technology and a digital Active Electronically Scanned Array architecture, the Sentinel A4 provides both 360-degree and stop-and-stare capability with a 75% increase in range. It also offers high performance in all conditions with ability to detect threats amid the “clutter” of bad weather, complex terrain and contested environments. Lockheed Martin has been investing in GaN technology for radar applications since 2002 and was the first to field production of radar systems featuring GaN with the TPS-77 in 2015 and Space Fence, which became operational in 2020.

For the TPY-4 radar, Lockheed Martin is maximizing mission flexibility and delivering the premier long-range, theater-level air surveillance radar. With the U.S. Air Force selecting the system for its Three Dimensional Expeditionary Long Range Radar (3DELRR) program in early 2022 and Norway then becoming the first international customer late last year, both are set to receive a generational leap in performance with a system designed from the ground up to detect more complex, hard-to-find targets of interest and doing so in challenging environments.

A prime focus with TPY-4 was building in the ability to meet customers' evolving requirements and missions as new challenges emerge. Updates to the radar are possible with simple software enhancements, avoiding more costly architectural or hardware changes.

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Lockheed Martin has also taken a “product line” approach with Sentinel A4 and TPY-4, and several others in its portfolio, aimed at making upgrades and sustainment more affordable. The two next-generation radars share common software and hardware technologies, allowing modular components to be shared across platforms while driving down costs and creating more opportunities to leverage innovation.

“We think that’s really going to benefit our customers over the lifetime of the radars, because as you want to develop future enhancements and upgrades for these systems it can be done in one place and easily leveraged into the other system for the other set of customers. Managing obsolescence becomes much easier. You can share those costs over a wider base. So we think our customers are already seeing the benefit of this product line approach and it will only be more so over the next 30-plus years that these systems are in the field,” Walsh said.

Building on Norway’s selection of the TPY-4, Walsh said Lockheed Martin is seeing a “significant amount” of interest in its next-generation radar portfolio from the international community.

“We’ve had a number of countries come and see the TPY-4 system up close at our facility,” Walsh said. “Both TPY-4 and Sentinel A4 offer international customers a high-performing radar that is globally interoperable, with high commonality across our portfolio allowing for long-term value, ease of sustainment and extensive reuse throughout air and maritime domains.”

With Sentinel A4 and TPY-4, Lockheed Martin continues to invest in advancing digital radar capability to meet evolving threats faced by nations worldwide. A core commitment to commonality, ease of integration, leveraging the best of next-generation technology all built around modular, open architecture principles is setting the course for future design and development priorities.



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