INSIDE
SMART INVESTMENTS:
EUROPEAN MISSILE DEFENCE MAKES IMPORTANT PROGRESS
Every day, missile defence systems safeguard hundreds of millions of people across Europe, identifying and responding to the unprecedented security challenges coming from multiple sides. These advanced, proven, interoperable systems ensure Europe has capabilities that will keep it safe.

Sustaining this level of protection requires smart, strategic investments by the member states of NATO and the European Union. Many of these countries are users of Raytheon’s Patriot Air and Missile Defense system and other defensive systems, which offer the best technology and the best value to taxpayers. This issue of the Missile Defence Update highlights the recent advancements, investments and strategies that allow European countries to rise to the challenge of stopping these threats.
SMART INVESTMENTS IN MISSILE DEFENCE

PROTECTING EUROPE THROUGH COLLABORATION AND INTEROPERABILITY

Europe is facing an increasingly complex web of security threats. The conflict in Syria, the rise of non-state actors across the Middle East and North Africa and Russia’s increasing military power together create an environment in which European countries should be prepared for a variety of attacks from a number of different directions.

These types of threats could come from a distance, in the form of short- and long-range missiles, and require advanced systems to detect and block them to keep Europe safe. Over the past few months, for example, missile attacks have been intercepted in the Middle East, reinforcing that an attack targeting Europe is possible, and that advanced, protective systems are of utmost importance to our European safety.

Strong protection depends on having the best technology, with trusted capabilities, and the ability to be deployed immediately. Waiting for systems that currently exist only on paper to become operational is a risk Europe cannot afford.

Raytheon’s Patriot Air and Missile Defense System has a proven track record in Europe and its neighbouring countries, meaning it provides user countries the opportunity to implement a ready-to-go missile defence system that is interoperable and layered, and relied upon by a community of partner nations. Constant testing and improvement within this network offer the 15 Patriot nations substantial cost benefits and unparalleled, layered protection.

As Europe’s security threats are multifaceted and increasingly difficult to predict, it is not enough to simply have the best defence technology – countries and defence alliances also must work together. Both NATO and the EU are vital to European security now and in the future, which means that various missile defence systems will have to be connected in order to collaborate across alliances and borders.

Collaboration like this will lead to faster, more effective and more accurate responses. It also increases efficiency and eases budgetary pressures, for example through the pooling of resources for maintenance and coordination of joint testing exercises. One clear example of this is the upgrade programme co-funded by all 15 nations that rely on Patriot for their defence. This is made possible by the unique network of users and the fact that Patriot is designed to be continuously upgraded and improved.

Continued investment in the Patriot also has many economic advantages that contribute to the growth of Europe’s defence industry. As part of Poland’s WISLA missile defence procurement, for example, Raytheon has offered a 50 percent work share to the Polish government, creating jobs, supporting suppliers and building skills in the workforce.

The same applies to Germany, where Raytheon has signed a new Memorandum of Understanding with German defence group Rheinmetall to cooperate globally on defence technology, forging a new strategic industry partnership to drive innovation globally.

By unifying missile defence through close collaboration and strong interoperability between systems, European countries can take proactive steps towards strengthening strategic autonomy and be confident in their ability to protect their residents. Patriot is the only combat-proven, currently operational air and missile defence system capable of deterring and defending against these rapidly evolving threats, and is therefore ideally placed to support EU and NATO in their defence efforts.
Since January 1st, 2015, Raytheon’s Patriot integrated air and missile defense system has shot down more than 100 tactical ballistic missiles in combat operations around the world. More than 90 of those intercepts involved the low-cost Raytheon-made Guidance Enhanced Missile family of interceptors.

Patriot employs multiple interceptor missiles to destroy ballistic and cruise missiles, aircraft and drones. Guidance Enhanced Missiles work by flying at extremely fast speeds to close with the threat and detonating a blast-fragmentation warhead at precisely the right moment.

“No single interceptor is a silver bullet,” said Tom Laliberty, Raytheon vice president of Integrated Air and Missile Defense. “Using a mix of defensive missiles increases cost-effectiveness and gives commanders operational flexibility to choose the right interceptor at the right time.”

Patriot missile defence systems are a cornerstone of national defence capabilities around the world, not just in Europe. In an environment of conflict and uncertainty, Patriot systems and other Raytheon technology have proven vitally important at neutralising threats and protecting people, with multiple activations over recent years.
HOW DOES LAYERED MISSILE DEFENCE WORK?

Regional protections against short-to-intermediate-range ballistic missiles

Defense against short-range ballistic missiles, large-caliber rockets, unmanned systems and cruise missiles

Defense against rockets, artillery, mortars, unmanned systems and cruise missiles

INTELLIGENCE REPORTS FROM NATO ALLIES AND EU MEMBER STATES HAVE SHOWN THAT THE THREATS PRESENTED BY BALLISTIC MISSILES HAVE INCREASED IN COMPLEXITY AND INTENSITY IN RECENT YEARS

With more frequent and more diverse security challenges, Europe needs state-of-the-art layered missile defence systems to ensure a consistently high level of security.

Defending Europe requires a robust system of integrated land, sea and space ballistic missile defence assets. Raytheon’s proven interoperable ballistic missile defence systems provide effective and overlapping capabilities that are as diverse as the threats they neutralise, from advanced sensors and 360-degree radar systems to interceptors that respond immediately.

Layered defence capabilities provide protection against threats travelling at a variety of altitudes, both in and out of the atmosphere, and over distances long and short.

In May 2016, the Aegis Ashore land-based missile defence system was opened in Romania, with ground broken on a second installation in Poland shortly after. Both sites will deploy Raytheon’s SM-3 interceptor, ideal for defending against short- to intermediate-range ballistic missiles.

NATO partners across the continent are building additional layers and adding capabilities. Joining the Patriot user community is one way to accelerate efforts to modernise integrated air and missile defences to defeat ‘lower-tier’ threats closer to cities, military bases, and critical infrastructure. Benefits of joining the growing Patriot user community include significant cost savings through shared maintenance, joint testing and equipment swaps.

When the next land-based SM-3 interceptor site becomes operational in Poland, all of Europe will be defended from ballistic missile attacks.
MISSILE DEFENCE UPDATE

MISSILE DEFENCE UPDATE

NEXT-GENERATION MISSILE TECHNOLOGY

From cutting-edge radar systems and interface technology to the engineering and build of missile interceptors, Raytheon continues to improve and modernise their defence capabilities to respond to evolving ballistic missile threats. Following successful intercept tests in February 2017, the Standard Missile-3 interceptor joins Raytheon’s SM-6 as the latest proven systems to receive groundbreaking upgrades.

The SM-3 Block IIA program continues to reflect Raytheon’s commitment to maturing national and regional ballistic missile defense capabilities. “Recent test successes keep the program on track for deployment at sea and ashore, building on Raytheon’s unequalled fifteen-year history of exo-atmospheric intercepts,” said Dr. Taylor W. Lawrence, Raytheon Missile Systems president.

The interceptor’s kinetic warhead has been enhanced to best address advanced and emerging threats, with improvements to the search, discrimination, acquisition and tracking functions. The kinetic warhead, along with larger rocket motors, allows SM-3 Block IIA to engage more sophisticated threats and protect larger regions from short- to intermediate-range ballistic missile threats, providing greater operational flexibility.

Future flight tests will continue to evaluate system performance, en-route to a deployment in support of the European Phased Adaptive Approach Phase 3. Once SM-3 is deployed in Poland, all of Europe will be protected from ballistic missile defence. The SM-3 IB variant most recently destroyed a ballistic missile target as part of a large multinational exercise off the coast of Scotland, illustrating the essential role that SM-3 plays in defense for our allies across Europe.

Complementing the improved SM-3, the SM-6 provides extended-range protection against fixed- and rotary-wing aircraft, unmanned aerial vehicles, cruise missiles and ballistic missiles in the terminal phase of flight. “International navies are seeking the level of sophisticated protection that SM-6 provides,” said Mike Campisi, Standard Missile-6 senior program director. “The flexibility of this multi-mission effector drives significant savings for our partners and allies; it’s the exact opposite of a boutique missile.”

SM-6 continues to go further and faster. It recently shattered the record for the longest range surface-to-air intercept – a milestone it set, and broke, twice before. SM-6 has also been successfully tested against objects on the ocean’s surface, adding anti-surface warfare to its repertoire.

Raytheon’s Stinger air defence missile provides premier short-range defence via man portable air defense systems, helicopter, and ground vehicle launch version, in service with the U.S. and 21 other member nations. Raytheon recently successfully tested proximity fuse equipped Stingers capable of intercepting small unmanned aerial systems, demonstrating that Stinger protects deployed ground forces against the latest threats.
There’s nothing like a concept car, a glittering show vehicle that displays the technology dreams of automakers. Glittering, and futuristic, they look great under spotlights on a rotating platform. But you don’t want to drive one down the highway until it’s been through rigorous testing.

The same goes for the sophisticated Patriot Integrated Air and Missile Defense System. Lives depend on it, and Raytheon is constantly upgrading and testing the system to make sure it uses the very latest technology.

“We’ve conducted more than 3,000 ground tests and 1,400 live fires for Patriot to date and I’m happy to say there will be countless more,” said Bill Tierney, director of testing for Patriot at Raytheon Integrated Defense Systems. “Each and every time we test or live-fire a Patriot, we uncover new ways we might improve or perfect Patriot in order to stay ahead of the constantly evolving threats.”

That was the approach Raytheon took with Patriot Post-Deployment Build (PDB) 8. Each post-deployment build is an upgrade to the currently fielded version of Patriot. PDB-7 is successfully engaging threats and saving civilian lives in an ongoing conflict in the Near East, but there’s always room for improvement.

“Staged demonstrations are well and good, but unless you’ve got soldiers rigorously testing, evaluating and using your system in an operationally realistic environment, you’ll never know how it might perform when lives are on the line,” said Joe DeAntona, vice president and business development executive at Raytheon Integrated Defense Systems, and retired Army air defender.

Testing for Patriot won’t end when the PDB-8 tests conclude. “Working closely with the governments of Patriot partner nations, Raytheon will keep testing Patriot, stressing it, and doing everything we can to find and address improvement opportunities with the system,” said Tom Laliberty, Raytheon’s vice president of Integrated Air and Missile Defense.

High-consequence environments like expressways and battlefields have a way of driving home the importance of the proverbial test track.

This is not a point that is lost on Mr DeAntona, who commanded a Patriot battalion during Operation Iraqi Freedom.

“I wouldn’t be here today if Patriot didn’t work as advertised, and there’s a whole lot of peace-time testing and refinement to thank for that,” said DeAntona. “I’m a living testament to the value of these tests.”
**Patriot Defends Europe**

**United States**
- 1985-present: Patriot partner
- 1985–present: U.S. Patriots based in Germany to defend Europe
- 2013–2015: Patriot deployed to defend Turkey
- 2014–present: Regional exercises in Germany, Poland, Czech Republic, Slovakia, Romania and Greece
- October 2016: Joint live-fire exercise with Germany
- October 2016: Signed Patriot upgrade contract
- October 2016: Committed to Patriot through 2040

**France**
- 2013–2015: Patriot deployed to defend Turkey
- 2015: Committed to Patriot through 2035

**Germany**
- 1985–present: Patriot partner
- 2013–2015: Patriot deployed to defend Turkey
- 2015: Committed to Patriot through 2040
- August 2016: Joint live-fire exercise with the Netherlands
- 2017: Announced intent to upgrade Patriot

**The Netherlands**
- 1984–present: Patriot partner
- 2013–2015: Patriot deployed to defend Turkey
- August 2016: Joint live-fire exercise with Germany
- October 2016: Signed Patriot upgrade contract
- October 2016: Committed to Patriot through 2040

**Spain**
- 2005–present: Patriot partner
- January 2015–present: Patriot deployed to defend Turkey

**Sweden**
- November 2017: Submitted LoR for Patriot
- February 2018: U.S. Congress notified of potential Patriot sale to Sweden

**Poland**
- March 2017: Submitted Patriot LoR
- July 2017: Signed Memorandum of Intent to procure Patriot with U.S. government
- March 2018: Signed Patriot LOA and became 14th Patriot partner nation

**Romania**
- November 2017: Signed Patriot LOA and became 14th Patriot partner nation
- 2017: Announced intent to procure Patriot with U.S. government

**Greece**
- 1999–present: Patriot partner
- August 2016: Host of the Netherlands-Germany live-fire exercise

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**Patriot Makes Its Way in Europe**

**Sweden**

On November 7, the Swedish Government authorised the Swedish Defence Materiel Administration (FMV) to send a Letter of Request to the United States government in order to enter into negotiations for the procurement of Patriot. The announcement brings the country closer to joining the growing group of European nations that rely on the combat-proven Patriot system to defend against ballistic and cruise missiles, advanced aircraft and drones.

As stated in the press release issued by the Swedish government, “The Armed Forces have advocated Patriot as a new air defence system, as it is a proven system with good delivery reliability and anti-ballistic missile capability.”

The aim of the negotiations is for delivery to begin in 2020 and for the system to be operational within the next defence framework period, i.e. by 2025 at the latest.

**Romania**

In November 2017, Romania signed the Letter of Offer and Acceptance for the procurement of 7 Patriot systems, an important first step which marks the launch of the national military procurement programme.

The Romanian military will receive Configuration 3+, the most advanced configuration currently available, as well as GEM-T and PAC-3 MSE interceptors. Raytheon intends to collaborate with local defence companies for the production and maintenance of Romania’s Patriot systems and has already signed a Memorandum of Understanding with AeroStar Bacau.

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**2017**

- **April**
  - Announced submission of Patriot LoR

- **October**
  - Raytheon and Romanian company Aerostar SA sign Memorandum of Understanding

- **November**
  - Procurement bill for Patriot approved by the Parliament
On March 28, 2018, Poland’s government signed a Letter of Acceptance (LOA) for the procurement of Patriot, paving the way for Poland’s Patriot force to rapidly reach Initial Operational Capability and setting the stage for the United States government to begin contract negotiations for the new systems.

Poland has ordered four self-contained fire units, capable of independent operation and equipped with anti-ballistic missiles. Prior to signing the Letter of Acceptance, Poland agreed to an industrial participation proposal offered by Raytheon and its industry partners. To facilitate Poland’s self-sufficiency, which is required by Polish law, Raytheon has agreed to transfer technology to Polish partners to the maximum extent permitted by law.

This LOA is for Phase I of “WISLA,” Poland’s two-phase, medium-range Integrated Air and Missile Defence procurement programme. Under Phase II, Poland has stated it intends to acquire additional Patriot fire units, as well as Gallium-Nitride-based 360-degree Active Electronically Scanning Array Radar, and SkyCeptor.

Poland’s commitment to Patriot

Poland joins the now 15 nation strong group of countries which trust Patriot to defend their citizens, military and sovereignty.

Poland’s procurement of Patriot strengthens trans-Atlantic partnership and security by enabling a common approach to integrated air and missile defence, and creating jobs in the US and Poland.

Wes Kremer
President of Raytheon Integrated Defence Systems
The Royal Netherlands Defence Materiel Organisation awarded Raytheon a contract to upgrade its Patriot Integrated Air and Missile Defense system with the Modern Man Station user interface, a move to significantly boost the nation’s missile defense capability.

“The Netherlands will continuously modernise Patriot as they intend to keep it in their inventory until at least 2040”, said Tom Laliberty, Raytheon vice president of Integrated Air and Missile Defense. “The Modern Man Station is an important step in the Royal Netherlands Army’s plan to upgrade their entire Patriot inventory to the most advanced capability currently available.”

“Patriot remains a pillar of NATO missile defense because it is the only fielded, combat-proven air and missile defense system capable of outpacing the evolving threat,” said Joe DeAntona, Raytheon vice president of business development for Integrated Air and Missile Defense.

“This upgrade will make it easier for The Netherlands to operate Patriot, and will provide them enhanced situational awareness.”

The Modern Man Station, or MMS, is the latest operator-machine interface upgrade to Patriot command and control shelters. It provides state-of-the-art, full-colour graphical user interface with LCD displays. It also has touch screens and soft keys for enhanced situational awareness, with best-in-class command and control decision support tools. MMS is used to identify and display airborne objects, track potential threats, and engage hostile targets, including aircraft, unmanned air vehicles, cruise missiles and tactical ballistic missiles.

This is only possible because of the investments already made by Rheinmetall and Raytheon and by their world-wide customer communities. The Patriot shared-cost approach for testing, upgrade and improvements, logistics support and software greatly benefits Germany and saves hundreds of millions in annual cost.

THE NETHERLANDS ENHANCES PATRIOT INVESTMENT

Thanks to strong strategic partnerships and over five decades of collaboration with the German defence industry, Raytheon is ready to help Germany face the defence challenges of the future.

At the heart of this is a strong partnership with Rheinmetall Defence to drive local growth and innovation. Following the signing of a Memorandum of Understanding between Raytheon and Rheinmetall in February 2017, the two companies are set to cooperate closely across a range of areas to help keep Europe safe, including not just air defence but cyber defence, simulation, ammunition and training. The partners have jointly developed an integrated offer based on Patriot Configuration 3+ and Rheinmetall NNBS short- and very short-range air and missile defense for the German Air Force. This offer will close Germany’s urgent NNBS capability gap, while maintaining and later upgrading the existing Patriot capabilities. A mix of effectors, gun systems, and, potentially in the future, lasers is best suited for this purpose to intercept the full spectrum of threats.

Rheinmetall and Raytheon have been supplying all of the ground-based air defense systems of the German Armed Forces for decades. A modernised Patriot system can be easily upgraded to Patriot Next Generation, a system that meets the German TLVS requirements. The transfer of the components of the upcoming German qualified anti-aircraft defence within the framework of NATO VJTF 2023 into the NNBS system is guaranteed and represents a sustainable investment. What’s more, potential procurement risks in terms of budget, time and technical implementation can be minimised through the strength of long-standing industrial partnerships and proven system competences.

READY NOW FOR GERMANY
LITHUANIA PURCHASES THE NASAMS SYSTEM

Following a technical agreement with the Norwegian Ministry of Defence in October 2016, on 26 October 2017 Lithuania’s Ministry of Defence signed a contract with Kongsberg Defence & Aerospace to complete the acquisition of two NASAMS batteries.

The NASAMS system, manufactured by Raytheon and its Norwegian partner Kongsberg, is the most widely-used short- and medium-range air defence system in NATO. Together, Raytheon and Kongsberg have delivered more than 70 fire units of the highly adaptable launcher.

As a part of the acquisition, Lithuania will obtain new additional equipment, training and an integrated logistics support package, as well as refurbishment and integration of government supplied components for a complete NASAMS system.
In May 2016, a new land-based missile defence system was launched in Romania. Dubbed Aegis Ashore, the site is operated under NATO control, providing regional ballistic missile defence protection. Construction has begun on a second installation in Poland. Both sites field the Raytheon-made SM-3® interceptor, the only weapon that can defend against short- to intermediate-range ballistic missiles from both sea and shore.

“Countering the threat of ballistic missile attacks... is a collective security challenge that requires collective defence,” U.S. Deputy Secretary of Defence Robert Work said in a news release regarding the partnerships with Poland and Romania.

The two land-based SM-3 missile sites join four U.S. Naval destroyers deployed out of Rota, Spain, as the backbone of the U.S. contribution to Europe’s regional missile defence.

“The U.S. and Europe are demonstrating their ability to integrate and collaborate on solutions,” said Dr. Mitch Stevison, vice president of Raytheon Air and Missile Defence Systems, during a missile defence briefing at the Royal United Services Institute in London. “But the threat is escalating, and Europe needs continued investment to deepen its defence.”

NATO partners across the continent are building other layers of the region’s missile defence, accelerating efforts to modernise their integrated air and missile defence systems to defeat “lower-tier” threats closer to cities, military bases and critical infrastructure.

These threats are best countered by the combat-proven Patriot Air and Missile Defence System, which has been tested more than 2,500 times in real-world conditions.

“Our partners must strike the right balance between making their own investments and working together through NATO and the EU on shared capabilities that enhance regional stability,” said Tim Glaeser, vice president of business development for Raytheon’s Integrated Air and Missile Defence Systems business, while attending GLOBSEC, a leading European security conference in April 2016. “Funds are limited, which is why interoperability is critical.”

During a POLITICO Playbook Live forum in Brussels in June 2016, NATO Secretary General Jens Stoltenberg reinforced the importance of interoperability to Europe’s collective defence. “We’re facing some new security threats and challenges,” said Stoltenberg. “None of us has all the tools in the toolkit; we have to work together to meet these challenges.”
RAYTHEON IN EUROPE
Committed to Europe’s Protection for More Than a Century

EUROPEAN PRESENCE

BY THE NUMBERS

100+ YEARS IN EUROPE
2,500+ EMPLOYEES
24 RAYTHEON LOCATIONS
66% OF RAYTHEON’S INTERNATIONAL SUPPLY BASE IS IN EUROPE
4 MANUFACTURING CENTRES
15+ PARTNERSHIPS
500+ SUPPLIERS

RAYTHEON MISSILE DEFENCE IN EUROPE

AN/TPY-2
EARLY WARNING RADARS
LAND-BASED SM-3
NASAMS
PATRIOT

RAYTHEON SOLUTIONS PROVIDE LAYERED DEFENCE CAPABILITIES ACROSS EUROPE
RAYTHEON’S EUROPEAN PARTNERSHIPS AND VENTURES HAVE GROWN LOCAL CAPABILITIES AND INNOVATION
### The Most Modern, and Combat-Proven Ballistic Missile Defence System in the World

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<th>PATRIOT</th>
<th>SAMP/T</th>
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<td>200+</td>
<td>0</td>
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<tr>
<td>100+</td>
<td>0</td>
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<td>7 (AND GROWING)</td>
<td>2</td>
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<tr>
<td>15 (AND GROWING)</td>
<td>2</td>
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<tr>
<td>220+</td>
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<td>11+</td>
<td>1</td>
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<td>1,400+</td>
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**Combat Engagements Versus Aircraft, Drones, Cruise and Ballistic Missiles**

- **Patriot**: 200+
- **SAMP/T**: 0

**Ballistic Missiles Destroyed in Combat Since 2015**

- **Patriot**: 100+ (AND GROWING)
- **SAMP/T**: 0

**NATO Nations Using the System**

- **Patriot**: 7
- **SAMP/T**: 2

**Nations Sharing Modernisation and Enhancement Costs**

- **Patriot**: 15 (AND GROWING)
- **SAMP/T**: 2

**Fielded Fire Units**

- **Patriot**: 220+
- **SAMP/T**: 15

**European Security Deployments Since 2014**

- **Patriot**: 11+
- **SAMP/T**: 1

**Flight Tests Versus Aircraft, Drones, Cruise and Ballistic Missiles**

- **Patriot**: 1,400+ (AND GROWING)
- **SAMP/T**: ~20

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**Patriot: The Most Advanced Combat-Proven Air & Missile Defence System in the World**

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<th>MEADS DEVELOPMENT PROJECT</th>
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<td><strong>Existing Customers</strong></td>
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<td><strong>NATO Users</strong></td>
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<td><strong>Flight Tests</strong></td>
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<td><strong>Fielded Fire Units</strong></td>
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<td><strong>Total Contract Awards Since December 2014</strong></td>
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**21st Century Era Technology**

- **Years Behind Schedule** | 0
- **Interceptor Missile Options** | 10+
- **360° Solution Available...** | 1
- **Nations with Combat Engagements** | 2024 (Best Case)

**In U.S. Army Inventory: 2048**

**U.S. Army Cancelled Program**

**Source**: Griephan Report
Standard Missile-3, shown here in this illustration, is the world’s only ballistic missile killer deployable on land or at sea.