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Acknowledged, agreed, and submitted by



Nominee's Signature

6/25/20
Date

Nominee's Name (please print): William G. Patterson _____

Title (please print): Senior Director, LTAMDS _____

Company (please print): Raytheon Technologies _____

AVIATION WEEK NETWORK

2020 Program Excellence Awards

NOMINATION FORM

Name of Program: Lower Tier Air and Missile Defense Sensor (LTAMDS)

Name of Program Leader: William G. Patterson

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Customer Approved

o Date: June 26, 2020, _____

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Supplier Approved (if named in this nomination form)

o Date: _____

o Contact (name/title/organization/phone): _____

CATEGORY ENTERED

Refer to definitions in the document "2020 Program Excellence Directions." You must choose one category that most accurately reflects the work described in this application. **The Evaluation Team reserves the right to move this program to a different category if your program better fits a different category.**

Check one

Special Projects

OEM/Prime Contractor Sustainment

OEM/Prime Contractor Systems Design and Development

Supplier System Design and Development

OEM/Prime Contractor Production

Supplier System Production

Supplier System Sustainment

Point Distribution

Executive Summary: Make the Case for Excellence (15 pts)		
Metrics 10 pts Predictive Metrics (10)	Program Volatility/ Uncertainty/Complexity/ Ambiguity 25 pts Describe overall VUCA (10) Cite examples of team response (15)	Organizational Best Practices & Team Leadership 40 pts Innovative Tools and Systems (15) Unique Innovative Processes for People Development/Knowledge Transfer (15) Unique Practices for Customer Engagement (10)
Value Creation (10 pts)		

Abstract

In 150 words or less, why is this program excellent in terms of execution?
(12 pt. Times Roman)

The Raytheon Missile & Defense Lower Tier Air and Missile Defense Sensor (LTAMDS) program team spent over three years researching and developing the next-generation lower tier radar for the U.S. Army’s Integrated Air and Missile Defense Battle Command System (IBCS). Their effort led to a groundbreaking 360-degree, gallium nitride-powered design selected by the U.S. Army as a Technology Maturation Risk Reduction (TMRR) Contractor in September 2018.

Soon after, the Army reevaluated its course and announced a bring-your-own-radar Sense-Off in April 2019. In one day, the program went from a traditional program to having six months to design, build, and field a final radar demonstrator capable of outperforming other contractors. Communication became crucial, and company barriers had to be broken to greatly increase speed and efficiency and integrate more staff. Raytheon Technologies earned the contract due to the excellent execution and effort by nearly 1,000 individuals working together.

Purpose

Provide a 150-word description of the purpose of this program, spelling out all acronyms and correct acronyms
(12 pt. Times Roman)

The Lower Tier Air and Missile Defense Sensor (LTAMDS) is a next-generation, 360-degree air and missile defense radar for the U.S. Army’s Integrated Air and Missile Defense Battle Command System (IBCS). LTAMDS increases detection and response abilities, allowing forward-deployed troops and forward-operating bases to better defend military sites, ports, utilities, and key logistical infrastructure. A simultaneous active electronically scanned array radar powered by gallium nitride (GaN) circuits, it has a stronger signal and enhanced sensitivity and better discriminates against faster, smaller, and farther-away threats.

LTAMDS seamlessly integrates into the Army's new architecture and provides a radar platform that can be upgraded for decades to come.

Executive Summary: Make the Case for Excellence (Value: 15 pts)

What is the vision for this program/project? What unique characteristics and properties qualify this program for consideration?

(12 pt. Times New Roman)

Threats in the lower-tier environment have been rapidly evolving. From rogue nation missiles to off-the-shelf drones, enemies have been finding new and evolving ways of causing harm through the air. To combat these threats, the U.S. Army issued a call to action in 2015 by opening the Lower Tier Air and Missile Defense Sensor (LTAMDS) competition to build a new radar for its Integrated Air and Missile Defense Battle Command System (IBCS).

Raytheon Missiles & Defense, a business of Raytheon Technologies, answered the call, turning three years of research and development into its selection as one of two finalists for long-term development. Then it answered again when a month later the Army announced it would hold a two-week live Sense-Off at the White Sands Missile Range to demonstrate the most capability. By leading the different and complicated product development demonstrations to provide a much-needed national defense solution, the Raytheon Technologies LTAMDS team has proved its excellence as a program of professionals.

The LTAMDS program at Raytheon Missiles & Defense delivers a 360-degree radar powered by semiconductor technology based on gallium-nitride, or GaN, that could also be upgraded for decades to come. The program has delivered on the Army's vision of an entirely new radar from the ground up for IBCS, which helps protect the lives and assets of the U.S. and allied nations from lower-tier airborne threats.

Raytheon Technologies is unique in its ability to understand and advance GaN technology, as it has invested more than \$300 million in GaN research, including the building of its own Department of Defense-accredited Category 1A Trusted Foundry. The company considers it the future of radar technology, as GaN circuits are capable of emitting up to five times stronger signals and boast greater sensitivity. LTAMDS builds off the company's two decades of innovation in the area, and having another GaN-powered radar in production will also increase Raytheon Missiles & Defense's ability to research, innovate, and further develop the technology.

The volatility, uncertainty, complexity, and ambiguity faced by the Raytheon Technologies LTAMDS program team occurred at nearly unheard of levels in terms of traditional defense acquisition. The flipping of a traditional, multiyear-long research and development program into a six-month scramble to build prototypes capable of outperforming other contractors was a unique circumstance faced by few major defense programs since the Second World War.

The combination of steady, active leadership with strong communication and a greater good mentality helped the program stay on track through the turbulence, especially impressive for a team of nearly 1,000 people working together. The LTAMDS team excelled before the Sense-Off was announced, then topped itself in the lead-up to and during the Sense-Off itself.

With the Army's announcement in October 2019 that the Raytheon Technologies LTAMDS program had earned the LTAMDS contract award, it was more than just a business triumph for the program and its team members. It proved that seemingly impossible tasks can be accomplished with hard work and commitment, and that their effort had made the world a safer place.

(Do not exceed 10 pages in responding to the following four descriptions; allocate those 10 pages as you deem appropriate, but it is important that you respond to all four sections.)

VALUE CREATION (*Value: 10 pts*)

Please respond to the following prompt:

- **Clearly define the value of this program/project for the corporation beyond profit and revenue**
- **Clearly define the value of this program/project to your customer**
- **Clearly define the value of this program/project to members of your team**
- **Clearly define the contribution of this program/project to the greater good (society, security, etc.)**

(12 t. Times Roman)

LTAMDS Program Value for Raytheon Technologies Beyond Profit and Revenue

Raytheon Missiles & Defense, a business of Raytheon Technologies, has been the main provider of the Patriot franchise for four decades. The system is a cornerstone of the company's portfolio and reputation, providing integrated air and missile defense capabilities to the United States and 16 other nations around the globe. But while Patriot is just one piece of the air and missile defense solutions provided by Raytheon Technologies, radars are a key technology element across the entire defense portfolio.

Selection as the provider of the Army's premier future radar secured the livelihood and reaffirmed the moral compass of thousands of people inside the company who work to keep the nation safe every day. Many company employees have also been working with or in Patriot partner nations for decades, supporting the defensive needs of the global community, and the selection of Raytheon Missiles & Defense to produce the Lower Tier Air and Missile Defense Sensor, or LTAMDS, will allow the business to maintain and strengthen those international relationships.

Additionally, LTAMDS provides the company with a new radar platform produced in volume, allowing increased research investments into software, advanced radar hardware, and mission integration abilities for future products or upgrades. This platform can be invested in by both Raytheon Missiles & Defense independent research and development funds and U.S. Army customer research and development funds, allowing the company to advance the state-of-the-art radar technology that keeps it not only competitive and relevant, but also a premier player in the marketplace.

Value of LTAMDS to U.S. Army

To have both the current and long-term ability to keep up with advanced airborne threats, the U.S. Army required a brand new platform that would be the basis for the next several decades of radar evolution. The system needed to fit in with the Army's new approach to command and control designed to get the best of breed for each system element and fight the fight more effectively. This approach included the creation of the new Army Integrated Air and Missile Defense (AIAMD) architecture and a new Integrated Battle Command System (ICBS), and the existing radar was not optimized to work in that new environment.

This is the true long-term value of LTAMDS to the Army — a new platform within the new AIAMD architecture that allows tremendous flexibility in terms of plug-and-play with best-of-breed components. While the existing radar platform has served the Army well since the 1980s, the new platform will pave the way for another four decades of success and innovation.

With airborne threats rapidly evolving — anyone can now turn a drone into a missile or bomb — the Army also couldn't wait the years that a traditional radar development contest would take. These threats, along with support from U.S. Congress, were driving a strong need for a new generation of radar that could be built sooner than later.

The LTAMDS offering from Raytheon Missiles & Defense provided the solution, giving the Army advanced technology that keeps up with evolving threats and that protects and keeps our service members and international partners safe. The transition to a sensor built on current technology also means the Army gets higher performance at lower operating costs, higher reliability and availability, and a lower staffing requirement.

The Value of LTAMDS to Program Team Members

Everyone likes to be on a team that works together, excels, and wins. Big programs can go down as colossal failures if done incorrectly, or be the birthplace of company legends when done right, like LTAMDS. Being on a program that worked together around the clock, seven days a week for months, to design, build, compete, and perform with radar capabilities that didn't exist months beforehand was an extremely beneficial experience, and one that is already well-known at the company.

The LTAMDS team members not only came away with an impressive and well-known accomplishment for their resumes, but they also gained countless learning and work experiences during the unprecedented effort. The company's significant investment in the program allowed them to see they weren't alone in their commitment to winning. Financial resources, personnel resources, and even transportation such as cargo planes were all made available because the project they were working on was that important and needed.

The combination of an important and difficult mission with this unified and committed response led to a sense of purpose that resonated among the program's employees. Technical specialists of all kinds got to work on something where everyone was reliable and pulling in the same direction. They were able to get results quickly and get the results they expected. This is something that doesn't always happen at a big company or big program, especially when nearly 1,000 employees from different departments were working together on a tight deadline.

Nearly everyone working on the team was also a technical specialist in one area or another, from systems engineers to hardware designers, radar designers, software developers, power and cooling system experts, supply chain experts, transportation and logistics specialists, factory production people, and field service specialists. They were each able to see the rewards of excelling at their specific technical discipline, and how it led to the greater team accomplishment.

For specialists such as these, the ability to go beyond providing their basic technical skills and instead flex and test their narrow, highly specialized skills was a rare opportunity. Now today, some of the same people are already being pulled into projects and asked to emulate the same techniques and skills that helped LTAMDS succeed.

How LTAMDS Contributes to the Greater Good

The LTAMDS sensor will help the IAMD system and the Army continue to defend the assets and people of the U.S. and allied nations as it improves what is already the world's premier air and missile defense

system. This recognized capability defends against more than just airborne threats — it also deters them. When bad people realize there's a good possibility they'll fail, the attempt often never even happens.

This strong shield protects lives and important assets, such as ports and train stations, and critical infrastructure, such as power and water plants. Recent events have further underscored the need for this defensive capability. Systems such as the LTAMDS-equipped IAMD allow the population to rest easy instead of resorting to the bomb shelters and fear of the past. Ultimately, it means society will continue to live under the protection of a modern platform capable of using the latest technology and advancements for decades to come.

METRICS (Value: 10 pts)

Please respond to the following prompt:

➤ **How do your predictive metrics drive action toward program excellence?**

(12 pt. Times Roman)

Traditionally, large defense programs normally take years of development, planning, and execution. Predictive metrics are used to schedule everything from staffing to the shipping of the final product, months and even years ahead. The Lower Tier Air and Missile Defense Sensor, or LTAMDS, was no different. The program was using defense development program measurement metrics such as:

- Integrated master schedules
- Integrated cost and schedule plans with earned value measures
- Productivity measures associated with lines of code per hour or hours per square foot of drawings
- Key performance metrics such as power, sensitivity, and emplacement time
- Sustainment metrics
- Supply Chain availability
- Employee staffing
- On-time purchase order placement
- Material and supply lead times
- Production cycle times
- Product test performance characteristics
- Engineering, drawing, software completion and validation plans
- Production capacity constraints
- Critical chain and reverse planning
- Critical Path Length Index to measure/monitor critical path length growth (bad) or shrinkage (good and expected) over time

These tools kept track of nearly every program aspect, allowing for the team performance and execution that led to the original selection of Raytheon Missiles & Defense as a TMRR finalist. However, everything changed immediately with the announcement of the switch to the Sense-Off. The program went from these tried-and-true measures of standards and a sure-fire, long-term plan to having to figure out how to squeeze years of work into a few months, all without losing quality and while doing it better than the competition. Traditional thinking on everything from master scheduling to how parts were acquired needed to be re-examined, rethought, and redone.

At the base level, almost everything was driven by the need to eliminate or reduce waiting time, which is the time period between people doing things, and cycle time, which is how long something takes to complete. The team couldn't afford to have anything wait or fall behind. The tight deadline, combined

with the integration of so many moving parts, meant that even a few days delay on one task would cause major ripple effects elsewhere. During a traditional development, the schedules and plans can quickly be adjusted to fit these realities of the day, such as late shipments or part shortages, without causing many issues down the line. However, this flipped during the run to the Sense-Off. The schedule was nearly unmovable and the day's reality needed to be fixed as soon as possible and readjusted to fit the plan.

To accomplish this, the program leadership tagged up twice a day to address issues as they happened. Teams were running in an Agile and Scrum environment, which is a methodology used during complex development projects such as software and hardware. Colleagues worked together to identify and knock down anything that could be done each day. Things that couldn't be resolved in the same day were rapidly escalated until solved. Everything that could create a delay or couldn't be accomplished immediately was brainstormed or predicted and then escalated to others to look for workarounds.

As such, the metrics were wrapped around speed and reducing cycle time and eliminating waiting time. Normally, if an engineer puts something to buy in the system for the buyer, it may take a week for the buyer to get around to ordering the part. In traditional design and production, it's that time between tasks that dictates the metrics and the total length of time to complete a project. But the normal waiting time and latency was something the LTAMDS program could not afford, and the team had to use a new way of thinking and working with metrics.

DEALING WITH PROGRAM CHALLENGES (VOLATILITY, UNCERTAINTY, COMPLEXITY, AMBIGUITY, OR VUCA) (Value: 25 pts)

Please respond to the following prompts:

- 10 pts: **Describe overall VUCA faced by your project/program.**
- 15 pts: **Cite specific example(s) and how your team responded.**

(12 pt. Times Roman)

Volatility, Uncertainty, Complexity, and Ambiguity Experienced by the LTAMDS Team

To understand the volatility, uncertainty, complexity, and ambiguity (VUCA) caused by the announcement of the Sense-Off, it is important to look at the history of the Lower Tier Air and Missile Defense Sensor. In 2015, the U.S. Army announced a traditional acquisition competition for a next-generation, lower-tier radar slated for delivery around 2027–2028.

For the next three years, the Raytheon Missiles & Defense LTAMDS program participated in the competition, ultimately being chosen in fall 2018 as one of two finalists to enter a phase called TMRR. Now in TMRR, the program was getting ready to spend two years producing a prototype laboratory demonstrator while maturing the technology, and then would be getting ready for the traditional engineering design and development phase. The team's three years of hard work had just secured the company several more years of project development and research.

However, threats in the lower tier continued to evolve. As government leaders began to realize the radar needed to be fielded as soon as possible, Congress directed the Army to speed up development. In response, the Army internally explored a plan to deliver the radar in 2022 by using a provision in the National Defense Authorization Act of 2016. It would allow them to bypass traditional defense acquisition regulations and ask industry to provide fielded prototypes in an expedited manner.

The approach meant the radar they would receive would have fewer years of development and therefore possibly have fewer abilities than what might have been built on the traditional schedule. However, it also meant the Army would get the radar years earlier, and it could always upgrade later as the technology

developed. Also important, it would satisfy the call to action placed by Congress and provide increased protection half a decade earlier than originally planned.

One month after the TMRR selection announcement, the Army held an industry day where Raytheon Missiles & Defense and its competitors were told the competition would be decided after a Sense-Off at the White Sands Missile Range in April 2019 and proposal submittal. Details about how the Sense-Off would be judged or what would be deemed a success were not released at this time, and the Army maintained a competition posture with respect to communications with the competitors, who were told to bring and demonstrate their best radar capabilities.

The decision resulted in a major course change for the Raytheon Missiles & Defense LTAMDS team. A competition that had been narrowed down to two finalists over years was now volatile and opened back up, and the next several years of planned work were replaced with an uncertainty about what the next day, week, or month would bring.

The task of building and fielding a groundbreaking radar became increasingly more complex within an extremely shorter timeline. The Army limiting communications through official channels and telling competitors to bring their best technology also made for ambiguity about what capabilities they deemed a necessity, and what the competition would hold as it was clear it was not going to be executed like a conventional government Operational Test & Evaluation program.

In addition, the technology needed for a radar worthy of the Sense-Off was supposed to have been fully developed in the lab over the next several years, not months. The VUCA-based questions began to pile up, including:

- How would the team effectively pivot from the lab to fielded radar demonstrator in a matter of months?
- Where would the required extra staffing and funding come from?
- What level of support would the company provide?
- What were the logistics of bringing supplies, products, and people to the Sense-Off?
- How would the Supply Chain work with such short notice?
- How would an expanded team be able to communicate and work together on such a big project with when little room for error or delay existed?
- What radar abilities were the customer's highest priorities?
- What would the competition bring to the table?

The Raytheon Technologies LTAMDS Program Response to VUCA

With assurances from the highest levels that if Raytheon Missiles & Defense was going to compete in the Sense-Off that it would do it with full funding and leadership support, the program quickly devised a plan. The approach was to first define what would win the day — the radar technology itself.

Years of high-level customer priorities, statements, documents, and relationships were examined to try to pin down the requirements they wanted most. Using this competitive intelligence, those identified desires were prioritized into a set of objectives that defined what hardware, software, and resources would be needed to make the Sense-Off a success. Trying to look through the Army's eyes, the team also realized if they were going with a rapid prototyping and fielding approach, then they should demonstrate what would be rapid and how they would integrate it into their urgent material release fielding plans.

With this groundwork laid, tools such as detailed planning, program management, reverse schedules, integrated master plans, schedules, milestones, inchstones, and regular measurement techniques were able to come into play. Due to the limited time frame, a set-in-place Agile operating process that worked with what it could find also supported all these plans and tools.

For example, designs were adapted to what supplies were available. If something wasn't on-hand, the team looked to the market to see what it could find, and if it couldn't be found in the market, the team went back and adapted and readapted its designs. Engineers scrounged labs for materials and equipment. In some instances where parts had lead times that could impact integration and program progress, the team turned to additive manufacturing to 3D print parts to keep the program moving on schedule till the final parts arrived.

Leadership began with one-a-day drills but quickly switched to two-a-day tag-ups. The senior leadership team helped remove roadblocks, such as diverting software, design, and other technical experts from their regular programs to help meet the staffing need — while still ensuring all commitments to customers were met. The program also made sure to keep calibrating itself against what it thought would win, making sure processes were flexible enough to adapt alternate approaches when primary plans proved unworkable. With no time for perfection, a standard was also set that it just needed to be good enough and safe enough so that it worked.

Additionally, Raytheon Missiles & Defense partnered with a number of nontraditional defense contractors such as Mercury Systems, General Tool Company, Cummings Aerospace, IERUS Technologies, nLogic and Kord Technologies. These contractors worked alongside team members to help rapidly address the emerging requirements, and had specific capabilities and technologies to satisfy the LTAMDS team's need for speed.

As for the actual radar the team would bring to the Sense-Off, the program had recently pivoted direction in response to a revised requirement set. This meant hardware and software development was well along but progressing from an engineering state to a customer demo was not usual. To address this, teams were created, each of which had to advance their designs and produce a customer-ready demo product in short time:

- One team would finish building out an early but fully integrated prototype.
- Another team would take the technology that was in the near-field range being calibrated and get it out into the field to start creating waveforms and acting like a radar.
- A third team would finish the design concept and build the demonstrator that was originally planned to be the company's final version before the switch to the Sense-Off.
- The fourth team worked with all three teams to conduct software integration, as engineers added new code to the existing mature base of code for GaN radar systems to create beams and track targets in the desert.

Still, these radar demonstrators were not in their final form factor. While the sense-off radar had all the necessary capabilities, all the appropriate components such as cooling, power, processing, and the array were configured for ease of access and troubleshooting during the Sense-Off.

To help the Army understand the size and shape of the proposed final form factor, the program reached out to an auto industry company that makes demo cars out of high-density foam. Working together, using the completed LTAMDS design drawings, they created a full-scale mockup of the proposed final LTAMDS that would mount on a tactical trailer and look and feel exactly like what final radar would

look like. This allowed the customer to walk around the mockup, see it in all its details, understand how soldiers would interact with it, how power would hook up to it, and how it would fit into their operating concept.

For the Sense-Off, it took a four-week period to organize and move a team of 70 people to the missile range. That move also translated to 16 trucks, eight trailers of equipment between personnel vans and power equipment and cooling equipment, signal processing vans and data reduction environments, classified laboratory environments, communications equipment, and personnel facilities. Some days work started at 2 a.m. at the range and didn't end until the late afternoon. The team also ran data analysis overnight so they could give a complete performance analysis in the morning for the Army to review, and had classified network lines established for this purpose.

In the end, the program's technology:

- Demonstrated the key mission capabilities to service members
- Validated the maturity of the LTAMDS design
- Acquired and tracked a variety of threat-representative targets
- Demonstrated advanced capabilities showcasing the company's solution
- Showcased ease of maintenance and sustainment to the customer

After proposal reviews that followed the Sense-Off, the Army awarded Raytheon Technologies the contract in October 2019.

ORGANIZATIONAL BEST PRACTICES AND TEAM LEADERSHIP *(Value: 40 pts)*

Please respond to the following prompts:

- **15 pts: In executing the program, what unique and innovative practices, tools and systems frame your program and help you achieve program excellence?**
 - **15 pts: What unique and innovative processes and practices are you using to develop people and transfer knowledge and how do you know they are working?**
 - **10 pts: What unique practices are you using to engage customers and how do you know?**
- (12 pt. Times Roman)*

Unique and Innovative Practices, Tools and Systems of the LTAMDS Program

The Raytheon Technologies Lower Tier Air and Missile Defense Sensor program instituted a SecDevOps approach across the entire team and all disciplines. This innovative model integrates security into the DevOps model that is becoming more common among large software engineering efforts, and blends development and operations together to design, develop, and deploy at greater speeds and quality.

The program also established integrated teams that worked in and with Agile environments and methodologies to drive rapid cycle time improvement. Agile, a framework of various iterative development methods, relies on organization and cross-functional teamwork.

At Raytheon Technologies, the Agile Framework for Product Development is an enterprise program to transform product development to deliver mission solutions faster at lower cost without compromising quality. It includes all business functions and is based on current and emerging industry practices including Agile, DevOps, Lean and Model-Based Enterprise. This gives the company a competitive advantage through:

- Improved product development cost and cycle time
- Increased product quality
- Enterprise cross-functional collaboration and alignment
- Common enterprise processes
- Enablers and learning
- Streamlined business investments
- Efficient and agile development cycles
- Increased employee empowerment
- Customer satisfaction and knowledge transfer

Several types of reviews were held to ensure all designs and plans were being considered from all angles. This included:

- Frequent peer reviews
- External independent reviews before all major progress milestones
- Leveraging company senior leaders to participate in key reviews
- Opening up each of the gate reviews to independent and external reviewers
- Using rigorous review walk-up processes to ensure key requirements and process steps were adequately addressed

Because the program had brought on a wide range of young, talented employees, a perpetual open door policy was implemented along with an open meeting approach to encourage engineers and employees to bring forward ideas. Senior employees of all types were brought in to help actively coach, mentor, and guide the younger employees. Daily team engagements were held, challenges were escalated, and everyone worked together to clearly identify and mitigate risks.

In terms of tools, the program employed the full suite of Raytheon Missiles & Defense engineering supply chain, including:

- Operations tools for requirements, decomposition and management
- Requirements decomposition and tracing in DOORS
- Integrated cost and schedule management programs
- Resource load integrated master schedules tied to the financial system
- System Integration Network Diagrams, tied directly to the IMS, used to identify key handoffs between functions and system readiness

The program also created requirements and supply in the Enterprise Resource Planning system and then used the company's in-house investments and its gallium nitride and gallium arsenide foundries to rapidly produce monolithic microwave integrated circuits, or MMICS, for the array. Additionally, the program also took advantage of Raytheon Missiles & Defense's \$70 million investment in its dedicated radar development facility in Andover, Massachusetts, and its near-field range anechoic chambers.

Unique and Innovative Processes and Practices to Develop People and Transfer Knowledge

A high-level call to action occurred at Raytheon Missiles & Defense when the Army announced the switch to the Sense-Off. Company leadership recognized the challenge meant the company needed to be all in or all out, and made a commitment to go all in with resources. To a program like LTAMDS, there

was no greater resource than people, and it needed unique and new ways to find them and bring them into the fold.

Vice presidents across the business conducted a horizontal talent review to identify the roles that needed to be filled at the top level. Then they determined which employees to put on the project, not with a focus on putting together a team full of stars, but instead on a championship team with all the right pieces and players who could work and grow together as one.

The leaders balanced skill sets with sets of experiences, and sought out people with temperaments conducive to working together in very high-stress, high-pace environments. This included employees who had a fair tolerance for ambiguity, ones who were self-starters or self-initiators, ones who could mentor younger team members, and ones known for looking out for colleagues. To use a basketball analogy, the leaders wanted players who would call picks or drift over to create a double team when things were getting tough.

To help develop these employees from across the company and integrate them into the existing program team, leadership asked them the following questions:

- What do you need to do to make your role happen?
- What favors do you need?
- What policies and procedures do you need removed or adapted?
- What resources do you need and what facilities do you need?
- What constraints do you need removed to meet the objective of getting to the Sense-Off?

Then, more important than asking those questions, leadership delivered on the answers and gave the teams what they needed to succeed. With this full leadership endorsement and resource availability, the project teams were able to each move together in the right direction.

The sense of openness on the program was also important to talent development and knowledge transfer. Twice daily tag-ups, weekly team meetings, leaders who rotated between teams to keep up with them, twice weekly roadblock removal meetings with vice presidents to keep them informed and get whatever resources were needed — it was all an open book.

It became known to every person on the team that they have to tell coworkers what's going on and that they have to tell leadership what's happening. For example, any problem that couldn't be solved in a day needed to be raised to others. This led to numerous people coming forward with issues they might otherwise have continued to privately struggle with, and just as important, it connected them with other talent so they could learn and problem-solve together.

Company leadership was able to tell the employee development approach was working because it witnessed this employee growth and teamwork firsthand with every challenge solved. Winning the competition also helped confirm the approach had the required impact.

Unique LTAMDS Program Engagement with the Army Customer

Engagement with the Army customer at Raytheon Missiles & Defense for the LTAMDS program can be broken into three stages: before, during, and after the Sense-Off.

Since the program had begun in 2015 during traditional development, there were regular and robust communications with the Army. This customer engagement structure was fully engaged and intimate. There were open lines of communications at the program management level and each of the technical team levels, and there were leads for each engineering team and each engineering discipline. Each of those employees had a counterpart on the Army customer side that they were in regular and active communication with, sometimes daily or every week at a minimum. These communications allowed for open sharing of progress and challenges on the company's side, and desires and requirements on the customer side.

When the Sense-Off was announced, the U.S. Army took a competitive posture in communications, as was expected, and limited them to formal communications through official channels. The LTAMDS program had to rely on what it already knew and what it could learn from various public documents and joint government-company planning sessions. While this initially created a level of anxiety and ambiguity among program members, they were able to lean on knowledge from those previous discussions and engagements to provide a strong enough understanding and foundation to figure out what was needed.

Upon the announcement that Raytheon Missiles & Defense had been awarded the contract, the Army's ability to communicate went right back to how it had been before the competition. Because the Raytheon Missiles & Defense LTAMDS team had previously established customer relationships, the program was able to rapidly reengage in constant communication at all organization levels on a regular basis.

Additionally, the Army customer has now been embedded on the program's technical and production teams. This means they are able to participate in the program's meetings, and challenges are communicated directly with the customer as they come up.