

# THAAD and Patriot Integration:

## From Operational Need to Operationalizing

By 1LT Michael J. McTiernan

**M**issile defenses, as stated in the 2022 Missile Defense Review, remains essential to the top priority of the National Defense Strategy: the defense of the homeland and deterring attacks against the United States of America.<sup>1</sup> Integrated Air and Missile Defense (IAMD), which is nested within the broader missile defeat approach, is the “integration of capabilities and overlapping operations to defend the homeland.”<sup>2</sup> Integration for AMD, accomplished mainly by modernization and subsequent validation through flight tests, remains critical to the lethality and credibility of the Air Defense Artillery branch. One recent advancement in integration that has the potential to revolutionize how we fight gravitates around the historic successes of B-2 ADA (THAAD) during Flight Test THAAD-21 at White Sands Missile Range in New Mexico. Here, the unit tested and validated software and hardware upgrades to the Terminal High Altitude Area Defense (THAAD) weapon

system that demonstrated the ability to fire PAC-3 MSE Interceptors from a Patriot M-903 Launcher using the Army-Navy Transportable Radar Surveillance (AN/TPY-2) sensor. The advancements made through this flight test are now being operationalized worldwide and may pave the way for greater integration into the Army’s Integrated Air and Missile Defense Battle Command System (IBCS) architecture. The following provides an overview of the THAAD weapon system, Flight Test THAAD-21, and the global impact of these modernization efforts.

### The Terminal High Altitude Area Defense (THAAD) Weapon System

The THAAD weapon system is a globally-transportable, rapidly-deployable capability that intercepts ballistic missiles during their terminal, or final, phase of flight.<sup>3</sup> It is an incredibly effective, combat-proven defense against short, medium, and intermediate-range ballistic missiles threats. It can conduct

engagements both inside and outside the atmosphere using hit-to-kill technology, whereby the interceptor’s kinetic energy destroys the incoming threat.<sup>4</sup> A standard THAAD battery is comprised of four primary components: (1) the AN/TPY-2, (2) the Fire Control unit, (3) the Launchers, and (4) the Interceptors.<sup>5</sup> Of all these components, the uniqueness of the AN/TPY-2 differentiates THAAD from all other Air Defense weapon systems, as

it is the largest air-transportable X-band radar in the world with incredibly high-resolution that allows for both tracking targets from a considerable distance and cueing other missile defense weapon systems.<sup>6</sup> In fact, the sensor has the ability to operate in two separate modes to support these functions: (1) Forward Based Mode (FBM) and (2) Terminal Mode (TM).<sup>7</sup> FBM is typically used when emplacing the radar in close proximity to potential adversary launch areas to provide missile tracking and discrimination information to other weapon systems.<sup>8</sup> In this



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mode, the AN/TPY-2 is not collocated with the other primary components of a traditional THAAD battery and thus cannot conduct engagements. Conversely, TM is used when the AN/TPY-2 is collocated with a THAAD battery and enables the detection and engagement of incoming threats by providing data to guide interceptors.<sup>9</sup>

The first THAAD battery, A Battery, 4th Air Defense Artillery Regiment, 11th Air Defense Artillery Brigade, activated nearly fifteen years ago in May of 2008.<sup>10</sup> There are now twelve AN/TPY-2 radars in the U.S. arsenal, with one more expected to complete production in 2025.<sup>11</sup> To own or possess this capability actually extends beyond just U.S. interests. For example, the United Arab Emirates procured two AN/TPY-2 radars in 2011 through U.S. Foreign Military Sales (FMS) channels.<sup>12</sup> The Kingdom of Saudi Arabia also purchased seven radars in 2018, with fielding to begin in 2024, also through FMS channels.<sup>13</sup> With its unique capabilities and worldwide demand, THAAD is, and will remain to be, a strategic consideration for friendly and adversary forces for the foreseeable future.

### **Operational Need to Integrate THAAD and Patriot**

If THAAD is such an advanced weapon system, why then does it need frequent upgrades? Not only does modernization typically make a weapon system more lethal, but these efforts often are in response to a Joint Emergent Operational Need (JEON). A JEON is something that arises when a Combatant Commander identifies gaps in capability that must be acted upon to prevent loss of life and/or critical mission failure. A JEON can drive the test community to innovate solutions to bridge these gaps and, in the world of Air Defense, typically results in flight tests dedicated to validating the new advancements. Regarding the THAAD weapon system, a JEON from United States Forces Korea (USFK) directed the need to integrate PAC-3 MSE capability into THAAD. The intention of this being to expand the overall battlespace for THAAD by combining the kinematic capability of the PAC-3 MSE with the range of the AN/TPY-2.<sup>14</sup> This integration would allow for opportunities to engage in both the upper-tier and lower-tier and enable the warfighter to use the right interceptor for the given threat.

### **Flight Test THAAD-21**

To address the concerns of USFK, the Missile Defense Agency (MDA), in partnership with the U.S. Army Program Executive Office Missiles and Space, U.S. Army Space and Missile Defense Command, and Ballistic Missile Defense System Operational Test Agency, set conditions to conduct Flight Test THAAD-21 (FTT-21) at White Sands Missile Range (WSMR) in New Mexico.<sup>15</sup> B-2 ADA (THAAD), 11th Air Defense Artillery Brigade, served as the operational unit for this flight test. In order to assume mission, the unit first had to conduct required system upgrades, especially to their organic AN/TPY-2, and receive new equipment training, or NET, to familiarize themselves with the software and hardware upgrades. Additionally, since the flight test required the integration of the Patriot M-903 Launchers, Soldiers whose technical and tactical expertise were specialized to the THAAD weapon system had to re-learn the Patriot equipment. This is especially the case for all the Soldiers on launcher crews who had not conducted Prepare for Movement and Emplacement (PM&E), Hot Crew, Alert State Assumption (ASA), or Missile Reload drills on Patriot launchers in several years.

Upon the completion of NET, B-2 ADA (THAAD) conducted roughly 100 miles of tactical movement from Fort Bliss, TX to WSMR, NM in August of 2021 in order to emplace their equipment. After arrival, they rapidly certified on all respective Air Defense Gunnery Tables (ADGTs) on both the THAAD weapon system and Patriot Launchers to confirm their ability to participate in the live fire exercises. Although FTT-21 is seen as the ultimate milestone for the mission, there were two additional phases executed prior to: (1) Controlled Test Vehicle-01 (CTV-01) and (2) the Cooperative Vulnerability and Penetration Assessment & Adversarial Assessment (CVPA/AA). CTV-01 served as an opportunity to demonstrate the ability to fire MSE interceptors against simulated targets, which verified the concept of a THAAD MSE Integration, or TMI, firing solution. Despite this phase not conducting a live intercept, it proved the system could communicate with the M-903 Launchers and could control MSE Interceptors while in flight. Following this, CVPA/AA intended to identify security vulnerabilities in the weapon system for future software upgrades and analyze how operational organizations react to cyber-related events. With these phases successfully completed,

FTT-21 served as an operational test that would assess the TMI firing solution on its ability to intercept a re-entry vehicle that mirrored the kinematics and flight profile of a short-range ballistic missile. In March of 2022, B-2 ADA (THAAD) successfully completed this phase by conducting a no-notice engagement of a Black Dagger target, marking the critical milestone of integration between the THAAD and Patriot weapon systems. With this historic achievement, B-2 ADA (THAAD) completed their mission at WSMR and verified the ability to provide necessary upgrades to all U.S. AN/TPY-2 sensors.

### Operationalizing the Success of Flight Test THAAD-21

With the success of FTT-21 comes the inherent responsibility to implement the advancements in capability to our THAAD batteries worldwide. As the flight test originated from a USFK JEON, it is only natural that U.S. THAAD assets in South Korea receive the desired upgrades in a timely fashion. In fact, by October of 2022, USFK delivered the equipment necessary to facilitate the upgrades that will, in the words of the South Korean Ministry of National Defense, “protect the South Korean people from North Korea’s missile threats.”<sup>16</sup> These upgrades, delivered only seven months after the completion of FTT-21, will provide U.S. forces increased battlespace and will allow the operator to choose the right interceptor for the right threat.

Although PAC-3 MSE integration served as a primary objective for FTT-21, B-2 ADA (THAAD) also tested another capability that was under development for multiple years, known as the THAAD remote kit. Already proven in a prior flight test, this capability would allow operators to remotely fire interceptors from forward located THAAD Launchers while the rest of battery, to include the AN/TPY-2, remain postured further behind.<sup>17</sup> The purpose of this being to allow interceptors more sitting options and increase the area it can defend, as well as increasing the total number of launchers a THAAD system is capable of operating.<sup>18</sup> This concept is also currently being utilized in South Korea, as U.S. forces remotely fired from the THAAD weapon system in March of 2023 during a large-scale military exercise.<sup>19</sup> This advancement in capability, compounded with USFK’s adoption of the TMI firing solution, clearly demonstrates how revolutionary the successes

of FTT-21 are. The efforts of B-2 ADA (THAAD) during this flight test bridged gaps in capability that are now resulting in operational impacts for forces around the world, making Air Defense more lethal and prepared to defend against the threats of adversaries.

### The Future of THAAD Integration

THAAD is, and will remain, a strategic-level asset that is crucial to the defense of the homeland and U.S. interests. Through the dedication and monumental success of B-2 ADA (THAAD), U.S. forces around the world now have the capability to better protect their forces and their defended assets through a TMI firing solution. However, modernization must continue well past these efforts if there will truly be integration between all Air Defense weapon systems. In fact, there is already roughly \$30 billion of the President’s Fiscal Year 2024 Defense Budget expected to be dedicated to “Missile Defeat and Defense” to support the overarching concept of “Integrated Deterrence.”<sup>20</sup> Two of the larger investments into this idea of Missile Defeat and Defense include (1) integrating THAAD into the Army’s Integrated Air and Missile Defense Battle Command System (IBCS) and (2) continuing production of the eighth operational THAAD battery.<sup>21</sup> With B-2 ADA (THAAD) already paving the way for THAAD and Patriot integration, it will only be a matter of time before THAAD becomes nested within IBCS architecture and provides the operator a greater air defense capability under the “any sensor, best shooter” concept. In a similar fashion to FTT-21, it should be the hope of all Air Defenders that this operational need to integrate THAAD into IBCS is tested through designated flight tests and rapidly operationalized to forces worldwide.



CPT Michael J. McTiernan is currently deployed to the United States Central Command (USCENTCOM) Area of Responsibility (AOR) in support of Op. SPARTAN SHIELD and serves as the Brigade Adjutant for the 11th Air Defense Artillery “Imperial” Brigade. He is a former THAAD Platoon Leader and the first Tactical Control Officer (TCO) in history to fire a PAC-3 MSE Interceptor using data provided by an AN/TPY-2. CPT McTiernan commissioned from the United States Military Academy at West Point in 2020 and holds a Bachelor’s degree in Business Management.

## Endnotes

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