

**SLOW IS SMOOTH AND SMOOTH IS FAST: HOW  
MANDATORY TECHNOLOGY READINESS  
ASSESSMENTS WILL ENABLE RAPID MIDDLE TIER  
ACQUISITIONS**

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I. Introduction

The 2017 *National Security Strategy of the United States* proclaimed that “[t]he United States must retain overmatch—the combination of capabilities in sufficient scale to prevent enemy success and to ensure that America’s sons and daughters will never be in a fair fight.”<sup>1</sup> Achieving overmatch requires the development and deployment of superior weapon systems and capabilities while “eliminat[ing] bureaucratic impediments to innovation” and “work[ing] with industry to experiment, prototype, and rapidly field new capabilities.”<sup>2</sup> The National Defense Authorization Act (NDAA) for Fiscal Year (FY) 2016 created the middle tier of acquisition (MTA) to achieve those goals.<sup>3</sup> However, in the four years since Congress introduced the MTA authority, the Department of Defense (DoD) has failed to fully reap its benefits, as programs have experienced significant cost overruns and delays.

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<sup>1</sup> WHITE HOUSE, NATIONAL SECURITY STRATEGY OF THE UNITED STATES OF AMERICA 28 (2017).

<sup>2</sup> *Id.* at 29.

<sup>3</sup> National Defense Authorization Act for Fiscal Year 2016, Pub. L. No. 114-92, § 804, 129 Stat. 726, 882–85 (2015).

The DoD could remedy this by adjusting its policy to require a technology readiness assessment (TRA) as part of MTA program initiation. While this may initially slow the process, it will contribute significantly to a smooth-running program and ultimately faster prototyping and fielding of new capabilities. In support of this proposal, Part II explains the background of the MTA and the other acquisition pathways it was intended to supplement. Part III provides an overview of the root causes of program failure, the dangers of delayed TRAs, and the effects of TRA timing on four current MTA programs. Part IV proposes changes to DoD Instruction 5000.80, *Operation of the Middle Tier of Acquisition (MTA)*, that would mandate TRAs for MTA program initiation and notice to the Under Secretary of Defense (Acquisition and Sustainment) (USD(A&S)) when programs use immature technologies.<sup>4</sup>

## II. Background

### A. Department of Defense Acquisition Framework

The DoD has traditionally utilized two major pathways for acquiring new capabilities: urgent capability acquisitions (UCA), which are intended to fulfill relatively small-scale urgent needs arising from combat operations,<sup>5</sup> and major capability acquisitions (MCA), which are intended to provide a deliberate process for obtaining complex and enduring systems.<sup>6</sup> The DoD has tried to develop and implement new capabilities using these pathways, but near-peer competitors continue to narrow the technological gap between themselves and the United States.<sup>7</sup> Congress has

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<sup>4</sup> U.S. DEP'T OF DEF., INSTR. 5000.80, OPERATION OF THE MIDDLE TIER OF ACQUISITION (MTA) para. 1.2(b) (30 Dec. 2019) [hereinafter DoDI 5000.80].

<sup>5</sup> U.S. DEP'T OF DEF., INSTR. 5000.02, OPERATION OF THE ADAPTIVE ACQUISITION FRAMEWORK para. 4.2(a)(2) (23 Jan. 2020) [hereinafter DoDI 5000.02]; U.S. DEP'T OF DEF., INSTR. 5000.81, URGENT CAPABILITY ACQUISITION para. 1.2(a) (31 Dec. 2019) [hereinafter DoDI 5000.81]; U.S. DEP'T OF DEF., DIR. 5000.71, RAPID FULFILLMENT OF COMBATANT COMMANDER URGENT OPERATIONAL NEEDS para. 3(a) (24 Aug. 2012) (C2, 29 May 2020) [hereinafter DoDD 5000.71].

<sup>6</sup> DoDI 5000.02, *supra* note 5, para. 4.2(c)(2); U.S. DEP'T OF DEF., INSTR. 5000.85, MAJOR CAPABILITY ACQUISITION para. 3.1(a)(1) (6 Aug. 2020) (C1, 4 Nov. 2021) [hereinafter DoDI 5000.85].

<sup>7</sup> Terri Moon Cronk, *Near-Peer Adversaries Work to Surpass U.S. in Technology*, *Official Says*, U.S. DEP'T OF DEF. (May 4, 2018), <https://www.defense.gov/Explore/News/>

recognized this modernization issue and has taken several steps to reform the DoD acquisition system, customarily through the annual NDAA.<sup>8</sup>

In section 804 of the FY 2016 NDAA, Congress created the MTA to increase the speed at which the DoD develops new systems and capabilities.<sup>9</sup> To improve speed, MTA grants the DoD the authority to determine whether and how to eliminate, abbreviate, or overlap certain steps in the development process, among them the TRA.<sup>10</sup> Middle Tier of Acquisition programs were intended only to pursue capabilities with a certain level of technological maturity to balance the risk of a delayed or skipped TRA.<sup>11</sup> As Part III discusses, this caused more delay than it saved. Before addressing the different acquisition paths it is important to understand what a TRA is.

## B. Technology Readiness Assessments

At its most basic level, a TRA produces a score assigned at a single point in time that indicates the maturity level of technology “critical to the performance of a larger system or fulfillment of a key objective of the acquisition program.”<sup>12</sup> The identified technologies are referred to as “critical technologies.”<sup>13</sup> A TRA completed early in the acquisition can identify risks that may not otherwise be realized until well into system development.<sup>14</sup> The TRA accomplishes this by systematically assessing the maturity of, and risks associated with, a given technology using pre-

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Article/Article/1512901/near-peer-adversaries-work-to-surpass-us-in-technology-official-says; Marcus Weisgerber, *Slow and Steady Is Losing the Defense Acquisition Race*, GOV'T EXEC., <https://www.govexec.com/feature/slow-and-steady-losing-defense-acquisition-race> (last visited Feb. 14, 2022).

<sup>8</sup> MOSHE SCHWARTZ & HEIDI M. PETERS, CONG. RSCH. SERV., R45068, ACQUISITION REFORM IN THE FY2016–FY2018 NATIONAL DEFENSE AUTHORIZATION ACTS (NDAAs) 1 (2018).

<sup>9</sup> *Id.*; National Defense Authorization Act for Fiscal Year 2016, Pub. L. No. 114-92, § 804, 129 Stat. 726, 882–85 (2015).

<sup>10</sup> National Defense Authorization Act for Fiscal Year 2016 § 804(c)(4)(E), (G). The Under Secretary of Defense (Acquisition and Sustainment) (USD(A&S)) has further delegated the authority to streamline procedures to the service components. DoDI 5000.80, *supra* note 4.

<sup>11</sup> DoDI 5000.80, *supra* note 4.

<sup>12</sup> U.S. GOV'T ACCOUNTABILITY OFF., GAO-20-48G, TECHNOLOGY READINESS ASSESSMENT GUIDE: BEST PRACTICES FOR EVALUATING THE READINESS OF TECHNOLOGY FOR USE IN ACQUISITION PROGRAMS AND PROJECTS 1 (2020) [hereinafter GAO TECHNOLOGY READINESS GUIDE].

<sup>13</sup> *Id.* at 10.

<sup>14</sup> *Id.* at 12.

determined metrics.<sup>15</sup> It can be conducted internally or independently from the organization developing the technology.<sup>16</sup>

The TRA will produce a technology readiness level (TRL) score, which is “based on the amount of development completed, prototyping, and testing within a range of environments from lab . . . to operationally relevant.”<sup>17</sup> The DoD uses nine technology readiness levels.<sup>18</sup> The lowest level of technology readiness is TRL 1, the point at which “[s]cientific research begins to be translated into applied research and development.”<sup>19</sup> At TRL 6, a “[r]epresentative model or prototype system . . . [has been] tested in a relevant environment.”<sup>20</sup> Generally, a TRL 6 score is a major milestone for technological development; any technology rated below TRL 6 is considered immature and a risk to the program.<sup>21</sup> At TRL 9, the final version of the system or technology has been tested and proven in mission operations or similar conditions.<sup>22</sup>

The TRL scores are not a risk assessment; rather, they provide principal data for programs to balance technical risks with program priorities or determine if a program is ready for the next phase.<sup>23</sup> A TRA completed periodically during program development also provides concrete data to justify costs, schedules, and progress to governing bodies like Congress.<sup>24</sup> Each acquisition pathway, including the UCA and MCA, discussed below, rely on different maturity levels for success.

### C. Urgent Capability Acquisition

The goal of the UCA pathway is to put new equipment into the warfighter’s hands as quickly as possible when current equipment cannot address new threats that arise during actual or anticipated contingency operations.<sup>25</sup> To achieve this, UCAs have a significantly streamlined

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<sup>15</sup> *Id.* at 9; MITRE CORP., SYSTEMS ENGINEERING GUIDE 509 (2014).

<sup>16</sup> MITRE CORP., *supra* note 15, at 509.

<sup>17</sup> *Id.* at 511.

<sup>18</sup> U.S. DEP’T OF DEF., TECHNOLOGY READINESS ASSESSMENT (TRA) GUIDANCE para. 2.5 (2011) [hereinafter DOD TRA GUIDE].

<sup>19</sup> *Id.*

<sup>20</sup> *Id.*

<sup>21</sup> *Id.*; MITRE CORP., *supra* note 15, at 512.

<sup>22</sup> DOD TRA GUIDE, *supra* note 18.

<sup>23</sup> GAO TECHNOLOGY READINESS GUIDE, *supra* note 12, at 4, 71, 80.

<sup>24</sup> *Id.* at 80.

<sup>25</sup> DoDD 5000.71, *supra* note 5, para. 3(a); DoDI 5000.81, *supra* note 5.

acquisition process.<sup>26</sup> Each service component can validate an urgent capability need that is specific to that component, and then initiate the acquisition program.<sup>27</sup> Urgent joint needs are staffed through a streamlined version of the Joint Capabilities Integration and Development System (JCIDS), the formal process for defining and validating requirements for MCAs.<sup>28</sup>

Once an urgent need is validated, the milestone decision authority (MDA) must determine if the program: (1) can be completed within two years, (2) requires minimal development, (3) is based on technologies that are proven and available, (4) can be acquired under a fixed price contract, and (5) provides any necessary exceptions.<sup>29</sup> Production and fielding should be complete within a few months of final design approval.<sup>30</sup> The program may adjust requirements in order to field a partial solution or shift to a different acquisition pathway if it does not appear that the necessary equipment is deployable within two years.<sup>31</sup>

The UCA pathway's aggressive timeline for delivering capabilities introduces significant risk to program success.<sup>32</sup> Utilizing mature technologies helps to manage this risk and meet program deadlines by avoiding the time, cost, and uncertainty of significant system development.<sup>33</sup> A \$525 million cap on research, development, and testing and a \$3.065 billion cap for the entire procurement limits the scale of the program and the potential cost of failure.<sup>34</sup> Since their goals differ, MCAs and MTAs balance technology, time, and cost risks differently from UCAs.

#### D. Major Capability Acquisition

The purpose of MCAs is “[t]o acquire and modernize military unique programs that provide enduring capability.”<sup>35</sup> To achieve the goal of delivering advanced and complete systems, MCA programs rely on a

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<sup>26</sup> DoDI 5000.81, *supra* note 5, para. 4.1(a).

<sup>27</sup> *Id.* para. 3.2(b).

<sup>28</sup> *Id.* para. 3.2(a).

<sup>29</sup> *Id.* para. 4.3(a)(2)(a)–(b).

<sup>30</sup> *Id.* fig.3.

<sup>31</sup> *Id.* para. 2.7(b).

<sup>32</sup> *Id.* para. 4.3(b)(1).

<sup>33</sup> See U.S. DEP'T OF DEF., RISK, ISSUE, AND OPPORTUNITY MANAGEMENT GUIDE FOR DEFENSE ACQUISITION PROGRAMS para. 2.1.1 (2017).

<sup>34</sup> DoDI 5000.81, *supra* note 5, para. 1.2(b).

<sup>35</sup> DoDI 5000.02, *supra* note 5, para. 4.2(c)(1).

structured and deliberate approach to development and acquisition.<sup>36</sup> The DoD divides these programs into acquisition categories based on cost, special interests, and complexity.<sup>37</sup> The deliberate nature of MCAs helps to control risk by ensuring each step is well researched and thoroughly developed, but it also means programs move at an incredibly slow pace.<sup>38</sup>

A significant feature (and common source of complaint) of MCA programs is the JCIDS requirement validation process.<sup>39</sup> The JCIDS process is meant to enable the Joint Requirements Oversight Council (JROC) to identify capability gaps affecting the joint force, validate new requirements based on those gaps, ensure that new capabilities can operate in a joint environment, and prevent services from developing redundant capabilities.<sup>40</sup> The JROC validates requirements based on initial determinations regarding the viability of a materiel solution and the risk of exceeding cost, schedule, and technological maturity metrics.<sup>41</sup> Validation can take fifteen to twenty-two months to complete.<sup>42</sup> Once approved, the program can transition to the technology maturation and risk reduction (TMRR) phase.

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<sup>36</sup> *Id.* para. 4.2(c)(2).

<sup>37</sup> DoDI 5000.85, *supra* note 6, at 19 tbl.1. Acquisition category (ACAT) I includes major defense acquisition programs (MDAP) and special interest acquisitions. *Id.* A program is designated as an MDAP if research, development, test, and evaluation costs will exceed \$525 million or the total acquisition will cost more than \$3.065 billion. *Id.* Acquisition category I is further subdivided into ACAT IB, IC, and ID, with different approval authorities for each subcategory. *Id.* Acquisition category II includes any program that does not meet ACAT I criteria and is a “major system,” defined as a program that will cost more than \$200 million in research, development, test, and evaluation costs or the total acquisition will cost more than \$920 million. *Id.* Acquisition category III includes any program that does not meet the dollar thresholds for ACAT I or II and is not a “major system.” *Id.*

<sup>38</sup> See Michael Bold & Margaret C. Roth, *A New Era of Acquisition*, ARMY AL&T, Winter 2020, at 9, 13–14.

<sup>39</sup> *Id.*; JOINT CHIEFS OF STAFF, INSTR. 5123.01I, CHARTER OF THE JOINT REQUIREMENTS OVERSIGHT COUNCIL AND IMPLEMENTATION OF THE JOINT CAPABILITIES INTEGRATION AND DEVELOPMENT SYSTEM encl. D, para. 1 (30 Oct. 2021) [hereinafter CJCSI 5123.01I].

<sup>40</sup> CJCSI 5123.01I, *supra* note 39, encl. A, para. 1(a)(1)–(2); *id.* encl. D, para. 2(c)(4).

<sup>41</sup> *JCIDS Process Overview*, ACQNOTES, <http://www.acqnotes.com/acqnote/acquisitions/jcids-overview> (June 7, 2021); *Capabilities Based Assessment (CBA)*, ACQNOTES, <http://www.acqnotes.com/acqnote/acquisitions/capabilities-based-assessment-cba> (June 16, 2021); *Initial Capabilities Document (ICD)*, ACQNOTES, <http://www.acqnotes.com/acqnote/acquisitions/initial-capabilities-document-icd> (Dec. 21, 2021).

<sup>42</sup> Jarrett Lane & Michelle Johnson, *Failures of Imagination: The Military’s Biggest Acquisition Challenge*, WAR ON THE ROCKS (Apr. 3, 2018), <https://www.warontherocks.com/2018/04/failures-of-imagination-the-militarys-biggest-acquisition-challenge>; ARMY ACQUISITION REV., ARMY STRONG: EQUIPPED, TRAINED, AND READY 35 (2011).

The DoD intends for the TMRR phase to reduce program risk before production.<sup>43</sup> During this phase, a program manager typically conducts a risk assessment; completes a TRA; and develops testing and evaluation plans, systems engineering plans, and cost estimates.<sup>44</sup> This allows the program manager to determine which technologies will be included and which technologies require additional development.<sup>45</sup> Early identification of gaps between a technology's maturity and the requirements for the program is essential to reducing risk.<sup>46</sup> Though TRAs are a necessary component of the TMRR phase, they are not required until contracting for prototypes or development services is about to begin, which occurs months or years into the program.<sup>47</sup> The program manager will typically schedule an additional TRA after a contract has been awarded.<sup>48</sup> This is in anticipation of a JCIDS decision point to begin production and show the system is ready to perform in an operational environment.<sup>49</sup>

The JCIDS process was intended to avoid redundant capabilities and consolidate spending on military acquisitions across service components. Developing capabilities that incorporate input from multiple sources, sometimes with competing interests, has the potential to produce high quality, reliable materiel solutions (e.g., the joint light tactical vehicle), but only as products of processes that can take years from inception to delivery.<sup>50</sup> All the while, near-peer competitors have accelerated their systems development and acquisition procedures, allowing them to move from research and development to prototyping and production in a fraction of the time.<sup>51</sup> The result is a rapidly closing gap in the technological

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<sup>43</sup> DoDI 5000.85, *supra* note 6, para. 3.8(a); *Technology Maturation & Risk Reduction (TMRR) Phase*, ACQNOTES, <http://www.acqnotes.com/acqnote/acquisitions/technology-development-phase> (June 22, 2021).

<sup>44</sup> DoDI 5000.85, *supra* note 6, para. 3.8(b)(1)–(2).

<sup>45</sup> *Id.* para. 3.8(a).

<sup>46</sup> U.S. GEN. ACCT. OFF., GAO/NSIAD-99-162, BEST PRACTICES: BETTER MANAGEMENT OF TECHNOLOGY DEVELOPMENT CAN IMPROVE WEAPON SYSTEM OUTCOMES 3 (1999) [hereinafter GAO BEST PRACTICES].

<sup>47</sup> 10 U.S.C. §§ 2366b, 2448b.

<sup>48</sup> U.S. GOV'T ACCOUNTABILITY OFF., GAO-12-339, DEFENSE MANAGEMENT: GUIDANCE AND PROGRESS MEASURES ARE NEEDED TO REALIZE BENEFITS FROM CHANGES IN DOD'S JOINT REQUIREMENTS PROCESS 3–8 (2012) [hereinafter GAO DEFENSE MANAGEMENT]; DoDI 5000.85, *supra* note 6, para. 3.11(b)(6).

<sup>49</sup> GAO DEFENSE MANAGEMENT, *supra* note 48; DoDI 5000.85, *supra* note 6, para. 3.12(b).

<sup>50</sup> ANDREW FEICKERT, CONG. RSCH. SERV., RS22942, JOINT LIGHT TACTICAL VEHICLE (JLTV): BACKGROUND AND ISSUES FOR CONGRESS 2 (2020); Weisgerber, *supra* note 7.

<sup>51</sup> Weisgerber, *supra* note 7.

superiority that has given the United States its overmatch capabilities.<sup>52</sup> The MTA is the most recent attempt to address this issue.

#### E. Middle Tier of Acquisition

Congress created the MTA to fill the gap between the immediate, relatively small-scale demands of UCAs and the deliberative, risk-averse process of MCAs. The MTA is divided into two separate authorities: rapid prototyping and rapid fielding.<sup>53</sup> While UCAs require fully matured technology and MCAs develop technology over a lengthy period, MTA programs are supposed to develop and utilize relatively mature technology that will result in a residual or fieldable operational capability within five years.<sup>54</sup>

The MTA rapid prototyping path is intended to develop a prototype in an operational environment or with a residual capability that can be fielded later.<sup>55</sup> Rapid prototyping programs can be initiated as stand-alone projects that will result in complete systems, used to develop prototypes that will be incorporated into a larger MCA program, or transitioned into an MTA rapid fielding program to introduce production-level quantities of systems within an additional five years.<sup>56</sup> Unlike MCAs, the DoD excludes MTA programs from the JCIDS process.<sup>57</sup>

Each service component developed its own merits-based process for validating requirements and initiating an MTA program.<sup>58</sup> For the Army, requirements are validated with an abbreviated capability development document (A-CDD), which is based on the capability development

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<sup>52</sup> *Id.*

<sup>53</sup> *Id.*

<sup>54</sup> DoDI 5000.02, *supra* note 5, para. 4.2(b)(1)–(2).

<sup>55</sup> DoDI 5000.80, *supra* note 4, para. 1.2(c).

<sup>56</sup> *Id.* para. 1.2(b). While there is some flexibility to develop, test, and demonstrate technology before final fielding, initial program production must begin within six months of program start and once the five-year limit is reached, the program must end or transition to operations and sustainment. *Id.* para. 1.2(d).

<sup>57</sup> *Id.* para. 1.2(e).

<sup>58</sup> *Id.* para. 3.1(a). Programs that exceed the MDAP or major systems thresholds must have: an acquisition decision memorandum signed by the milestone decision authority, an initial program introduction document, an approved requirement, an acquisition strategy, a cost estimate, and a written decision by the USD(A&S). *Id.* para. 4.1(a)–(f).



document used in JCIDS but not developed to the same extent.<sup>59</sup> Both the A-CDD and the MTA acquisition strategy must address technology maturity and technical risk; however, there is no requirement to conduct a TRA prior to or during the program.<sup>60</sup> Instead of a formal TRA, program managers sometimes rely on their familiarity with a technology or paper-based technology reviews.<sup>61</sup>

The MTA pathway promised to accelerate modernization and acquisition efforts by removing unnecessary bureaucracy, streamlining program initiation requirements, and driving decision-making authority to lower levels.<sup>62</sup> Unfortunately, some MTA programs traded excessive technical risk for earlier program initiation.<sup>63</sup> Ultimately, this cost those programs the very speed they had hoped to achieve.

### III. Postponing or Eliminating Technology Readiness Assessments Negatively Impacts Middle Tier of Acquisition Program Success

The relatively short timeline for MTA programs puts pressure on program managers to start prematurely. As a result, some programs delay TRAs until late in the prototyping process, long after the development of program requirements.<sup>64</sup> Programs that do not conduct an initial TRA experience significant cost overruns and schedule delays. These issues place the programs and the MTA pathway at risk of failure.<sup>65</sup>

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<sup>59</sup> Pol’y Memorandum, Assistant Sec’y of the Army (Acquisition, Logistics & Tech.), subject: Office of the Assistant Secretary of the Army (Acquisition, Logistics and Technology) Middle Tier of Acquisition Policy (20 Mar. 2020) [hereinafter ASA(ALT) Policy Memo]; Memorandum for Record, Gen. John M. Murray, subject: Army Futures Command Abbreviated Capability Development Document Definition (7 June 2019).

<sup>60</sup> DoDI 5000.80, *supra* note 4, tbl.1, n.4.

<sup>61</sup> GAO TECHNOLOGY READINESS GUIDE, *supra* note 12, at 48.

<sup>62</sup> U.S. GOV’T ACCOUNTABILITY OFF., GAO-19-439, DoD ACQUISITION REFORM: LEADERSHIP ATTENTION NEEDED TO EFFECTIVELY IMPLEMENT CHANGES TO ACQUISITION OVERSIGHT 27–28 (2019) [hereinafter DoD ACQUISITION REFORM].

<sup>63</sup> See generally GAO TECHNOLOGY READINESS GUIDE, *supra* note 12.

<sup>64</sup> U.S. GOV’T ACCOUNTABILITY OFF., GAO-20-439, DEFENSE ACQUISITIONS ANNUAL ASSESSMENT: DRIVE TO DELIVER CAPABILITIES FASTER INCREASES IMPORTANCE OF PROGRAM KNOWLEDGE AND CONSISTENT DATA FOR OVERSIGHT 100, 104, 106 (2020) [hereinafter DEFENSE ACQUISITIONS ANNUAL ASSESSMENT].

<sup>65</sup> See discussion *infra* Section III.A.3.

### A. Root Causes of Program Failure

Acquisitions of new equipment or vehicles face a range of challenges as the program moves from initial concept to final delivery. Some of these challenges may simply set the program back while others are root causes for program failure, including the following items: requirement issues, cost overruns, schedule delays, and congressional intervention.

#### *1. Requirement Issues*

Requirement issues surface in several different forms. They can be too aggressive, often in the form of an extensive list of system capabilities that must be met to achieve operational goals.<sup>66</sup> Some capabilities may conflict with one another, such as high armor requirements in conjunction with low gross weight.<sup>67</sup> Though some individual capabilities may require less development than others, integrating a long list of capabilities often requires extensive development, which can lead to cost overruns or schedule delays.<sup>68</sup> New threats may impose additional requirements or render the original requirements invalid and the capability under development no longer relevant or useful.<sup>69</sup> This occurs when the development phase has taken too long or when there is a failure to assess the service component's needs thoroughly before validating system requirements.<sup>70</sup> Reliance on technology that is immature and based on "too many technical unknowns and not enough knowledge about the performance and production risks they

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<sup>66</sup> U.S. GOV'T ACCOUNTABILITY OFF., GAO-15-469, DEFENSE ACQUISITION PROCESS: MILITARY SERVICE CHIEFS' CONCERNS REFLECT NEED TO BETTER DEFINE REQUIREMENTS BEFORE PROGRAMS START 8–9 (2015); ANDREW FEICKERT, CONG. RSCH. SERV., R45519, THE ARMY'S OPTIONALLY MANNED FIGHTING VEHICLE (OMFV) PROGRAM: BACKGROUND AND ISSUES FOR CONGRESS 2–3, 9, 12 (2021).

<sup>67</sup> FEICKERT, *supra* note 66, at 9; U.S. GOV'T ACCT. OFF., GAO-02-201, DEFENSE ACQUISITIONS: STEPS TO IMPROVE THE CRUSADER PROGRAM'S INVESTMENT DECISIONS 19 (2002).

<sup>68</sup> GAO TECHNOLOGY READINESS GUIDE, *supra* note 12, at 49.

<sup>69</sup> CAPTAIN MATTHEW R. BOGAN ET AL., NAVAL POSTGRADUATE SCH., NPS-AM-18-011, FAILURE IS NOT AN OPTION: A ROOT CAUSE ANALYSIS OF FAILED ACQUISITION PROGRAMS 32–33, 39 (2017).

<sup>70</sup> *Id.* at 23; U.S. GOV'T ACCOUNTABILITY OFF., GAO-08-408, DEFENSE ACQUISITIONS: 2009 IS A CRITICAL JUNCTURE FOR THE ARMY'S FUTURE COMBAT SYSTEM 23 (2008) [hereinafter GAO-08-408].

entail” may fail to deliver the desired capability.<sup>71</sup> Attempts to overcome these requirement issues usually lead to other root causes of failure such as cost overruns and schedule delays.<sup>72</sup>

## 2. Cost Overruns and Schedule Delays

Cost overruns and schedule delays are closely related causes of program failure. Senior service component and DoD leaders, as well as Congress, monitor DoD budgets for procurement of major systems.<sup>73</sup> When programs fail to consider accurately their technology requirements or the timetable to develop necessary but immature technology, one of the few options to maintain the schedule is to “crash” it by requesting additional resources and funding or overlapping development and production schedules.<sup>74</sup> There is no set threshold at which congressional involvement or project cancellation occurs, but both become more likely as costs increase, scheduling delays extend, and program requirements become obsolete.<sup>75</sup>

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<sup>71</sup> BOGAN ET AL., *supra* note 69, at 23 (quoting U.S. GOV’T ACCOUNTABILITY OFF., GAO-09-501T, DEFENSE ACQUISITIONS: DOD MUST PRIORITIZE ITS WEAPON SYSTEM ACQUISITIONS AND BALANCE THEM WITH AVAILABLE RESOURCES 8 (2008)).

<sup>72</sup> The Future Combat System was intended to modernize the entire brigade, introducing new vehicles, Soldier-enhancing equipment, and advanced networking capabilities. However, it suffered from an overreliance on immature technology. Halfway through development, forty-two of the forty-four critical technologies necessary were not mature enough to function in an operational environment. GAO-08-408, *supra* note 70, at 5, 16; GAO TECHNOLOGY READINESS GUIDE, *supra* note 12, at 48–49; GAO BEST PRACTICES, *supra* note 46, at 17.

<sup>73</sup> Planning, programming, budgeting and execution is a DoD process for generating DoD’s portion of the President’s annual budget request to Congress. The process typically begins more than two years before the fiscal year in question. BRENDAN W. MCGARRY, CONG. RSCH. SERV., IF10429, DEFENSE PRIMER: PLANNING, PROGRAMMING, BUDGETING, AND EXECUTION (PPBE) PROCESS (2020); Sydney J. Freedberg Jr., *Can the Army Convince Congress It’s Learned from FCS?*, BREAKING DEF. (Mar. 16, 2020, 5:41 PM), <https://breakingdefense.com/2020/03/can-the-army-convince-congress-its-learned-from-fcs>.

<sup>74</sup> Schedule crashing adds resources to a project (typically in the form of personnel or overtime hours) in order to decrease a program’s schedule; however, schedule crashing only works for certain types of problems. Programs can also fast-track phases, executing simultaneously instead of sequentially. Both add risk if not carefully assessed and managed. *Schedule Compression*, ACQNOTES, <http://acqnotes.com/acqnote/tasks/schedule-compression> (June 15, 2021); BOGAN ET AL., *supra* note 69, at 24.

<sup>75</sup> BOGAN ET AL., *supra* note 69, at 41.

### 3. Congressional Intervention

As cost overruns and schedule delays manifest, Congress may begin to question whether the program can achieve its objectives within an acceptable budget and timeframe.<sup>76</sup> Congress often calls senior leaders to testify when programs fall behind schedule or request additional funding.<sup>77</sup> While Congress may consider continuing a program, new priorities may arise where money can be better spent, leaving the struggling program with a drastically reduced or completely eliminated budget.<sup>78</sup>

Congress's growing frustration with DoD implementation and use of the MTA pathway is prompting increased congressional involvement in individual programs. When the FY 2016 NDAA created the MTA, it directed the DoD to issue MTA program guidance within 180 days.<sup>79</sup> After seventeen months, the DoD was only able to issue initial guidance, as each service component advocated for different MTA guidelines.<sup>80</sup> The Government Accountability Office (GAO) questioned if "middle-tier acquisition programs represent sound investments and are likely to meet the objective of delivering prototypes or capability to the warfighter within 5 years."<sup>81</sup> In response, the House Armed Services Committee Chairman, Congressman Mac Thornberry, introduced section 837 of the FY 2020 NDAA, withholding 75% of funds for MTA programs if the DoD did not issue guidance by 15 December 2019.<sup>82</sup> Since the FY 2020 NDAA was

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<sup>76</sup> GAO TECHNOLOGY READINESS GUIDE, *supra* note 12, at 111; GAO-08-408, *supra* note 70, at 40–41.

<sup>77</sup> Freedberg Jr., *supra* note 73.

<sup>78</sup> BOGAN ET AL., *supra* note 69, at 42.

<sup>79</sup> GAO Finds DOD Middle-Tier Acquisition Pathway Needs More Oversight, SMALLGOVCON (July 1, 2019), <https://smallgovcon.com/reports/gao-finds-dod-middle-tier-acquisition-pathway-needs-more-oversight>.

<sup>80</sup> *Id.*

<sup>81</sup> DoD ACQUISITION REFORM, *supra* note 62, at 36. The Government Accountability Office is Congress's independent watchdog that provides "objective, non-partisan, fact-based information to help the government save money and work more efficiently." *About GAO*, U.S. GOV'T ACCOUNTABILITY OFF. <https://www.gao.gov/about/> (last visited Feb. 14, 2022); Eric Lofgren, *Too Many Cooks in the DoD: New Policy May Suppress Rapid Acquisition*, DEF. NEWS (Jan. 2, 2020), <https://www.defensenews.com/opinion/commentary/2020/01/02/too-many-cooks-in-the-dod-new-policy-may-suppress-rapid-acquisition>.

<sup>82</sup> Sandra Erwin, *Congress Worries Authorities It Gave DoD Might Backfire*, SPACENEWS (May 23, 2019), <https://spacenews.com/congress-worries-authorities-it-gave-dod-might-backfire>; Mike Schaengold et al., *The FY 2020 National Defense Authorization Act's Substantial Impact on Federal Procurement Law—Part I*, 62 GOV'T CONT. ¶ 6, Jan. 15, 2020, at 1, 7.

signed after 15 December 2019, the DoD was able to avoid the funding cut when it issued DoD Instruction 5000.80 on 30 December 2019.<sup>83</sup>

Congress has continued to impose new requirements that threaten individual programs and the potential success of the MTA pathway. The FY 2017 NDAA introduced a requirement for all MTA programs that exceeded the major defense acquisition programs (MDAP) threshold to provide a summary report to Congress with “estimated cost, schedule, and technology risks information.”<sup>84</sup> The FY 2020 NDAA expanded the Secretary of Defense’s quarterly acquisition report to Congress to include any non-MDAP program (i.e., MTA programs that went above the MDAP threshold).<sup>85</sup> The FY 2020 NDAA also introduced a requirement for the Secretary of Defense to report updates on procedures for tailoring MTA acquisition methods.<sup>86</sup> Both of these NDAA sections imposed additional layers of oversight and bureaucracy on a process that Congress intended to streamline. Finally, in the 2020 budget report, the House Appropriations Committee raised concerns about an Air Force MTA program and “significant reprogramming requests to keep the program on schedule . . . [and] whether the use of authorities for middle tier acquisition . . . is appropriate . . . .”<sup>87</sup> Continued mismanagement or misuse of the MTA pathway risks additional bureaucracy and restrictions on the flexibility that was intended to empower MTA programs. The four MTA programs discussed in the next section show the link between TRAs and the root causes for failure that can prompt congressional intervention.

## B. Case Studies

### *1. Optionally Manned Fighting Vehicle*

In 2019, the Army used the MTA to initiate the optionally manned fighting vehicle program, its third attempt to replace the M2 Bradley

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<sup>83</sup> Schaengold et al., *supra* note 82; Lofgren, *supra* note 81.

<sup>84</sup> SCHWARTZ & PETERS, *supra* note 8, at 5; National Defense Authorization Act for Fiscal Year 2017, Pub. L. No. 114-328, § 808, 130 Stat. 2000, 2262–65 (2016).

<sup>85</sup> National Defense Authorization Act for Fiscal Year 2020, Pub. L. No. 116-92, § 830, 133 Stat. 1198, 1492 (2019).

<sup>86</sup> Schaengold et al., *supra* note 82, at 1, 6.

<sup>87</sup> H.R. REP. NO. 116-84, at 280 (2019); Erwin, *supra* note 82.

Fighting Vehicle.<sup>88</sup> In order to field units by FY 2026, the Army issued a request for proposals (RFP) with aggressive requirements and a tight schedule.<sup>89</sup> The original requirements included several advanced technologies or incongruous metrics: “remotely controlled operations,” troop capacity limits, air transportability, “dense urban terrain operation” capabilities, survivability metrics, lethality metrics, support for “preplanned product improvements,” “embedded platform training,” operational range, reactive armor, active protection, artificial intelligence, and the ability to field directed energy weapons.<sup>90</sup> The first TRA was not scheduled until after prototypes had been received and the decision to enter production was imminent.<sup>91</sup>

Though multiple companies had originally expressed interest, only two prepared prototypes in response to the RFP.<sup>92</sup> One company was unable to deliver their prototype in accordance with the RFP and was eliminated from further consideration, leaving only one prototype as the potential replacement.<sup>93</sup> The Army cancelled the RFP and tacitly acknowledged its failure to incorporate mature technologies, stating “a combination of requirements and schedule overwhelmed industry’s ability to respond within the Army’s timeline.”<sup>94</sup>

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<sup>88</sup> FEICKERT, *supra* note 66, at 9.

<sup>89</sup> *Id.* “Requests for proposals (RFPs) are used in negotiated acquisitions to communicate Government requirements to prospective contractors and to solicit proposals.” FAR 15.203(a) (2019).

<sup>90</sup> “A [directed energy (DE)] weapon is a system using DE primarily as a means to incapacitate, damage, disable, or destroy enemy equipment, facilities and/or personnel. . . . [Directed energy] examples include active denial technology, lasers, [radio frequency] weapons, and DE anti-satellite and [high-powered microwave] weapon systems.” JOINT CHIEFS OF STAFF, JOINT PUB. 3-13.1, ELECTRONIC WARFARE I-16 (8 Feb. 2012); FEICKERT, *supra* note 66, at 2–3.

<sup>91</sup> DEFENSE ACQUISITIONS ANNUAL ASSESSMENT, *supra* note 64, at 106.

<sup>92</sup> FEICKERT, *supra* note 66, at 9–12. The original manufacturer for the Bradley, BAE Systems, declined to submit a prototype, stating it did not meet their goals and business plan. Jen Judson, *Major Combat Vehicle Player Won’t Play in US Army’s Optionally Manned Fighting Vehicles Race*, DEF. NEWS (June 10, 2019), <https://www.defensenews.com/land/2019/06/10/major-combat-vehicle-player-wont-participate-in-us-armys-optionally-manned-fighting-vehicle-competition>.

<sup>93</sup> Sydney J. Freedberg Jr., *Bradley Replacement: Army Risks Third Failure in a Row*, BREAKING DEF. (Oct. 7, 2019, 4:02 PM), <https://breakingdefense.com/2019/10/bradley-replacement-army-risks-third-failure-in-a-row>.

<sup>94</sup> *Army Decides to Cancel Current OMFV Solicitation*, U.S. ARMY (Jan. 16, 2020), [https://www.army.mil/article/231775/army\\_decides\\_to\\_cancel\\_current\\_omfv\\_solicitation](https://www.army.mil/article/231775/army_decides_to_cancel_current_omfv_solicitation).

In July 2020, the Army requested comments from industry regarding a draft RFP with drastically reduced requirements and preferred characteristics.<sup>95</sup> Industry has been receptive to the adjusted approach, but there have still been repercussions for the initial misstep.<sup>96</sup> In July 2021, the Army chose five companies to develop “rough digital concept designs” for the optionally manned fighting vehicle with prototyping beginning in FY 2025.<sup>97</sup> Meanwhile, Congress has reduced the program’s budget by 11.1%.<sup>98</sup> Despite the requirement issues, schedule delay, and early congressional involvement, an adjusted TRA schedule has not been adopted.<sup>99</sup>

## 2. Medium Unmanned Surface Vehicle<sup>100</sup>

The medium unmanned surface vehicle (MUSV) is one component of the Navy’s effort to accelerate development of a next-generation fleet of unmanned and partially manned ships to counter near-peer competitors like China.<sup>101</sup> The MUSV will independently “function as a sensor and

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<sup>95</sup> Ashley Roque, *Industry Set to Weigh in on U.S. Army’s Latest OMFV Plan*, JANES (July 21, 2020), <https://janes.com/defence-news/news-detail/industry-set-to-weigh-in-on-us-armys-latest-omfv-plan>.

<sup>96</sup> Sydney J. Freedberg Jr., *OMFV: Can Army Exorcise the Ghost of FCS?*, BREAKING DEF. (Apr. 13, 2020, 4:09 PM), <https://breakingdefense.com/2020/04/omfv-can-army-exorcise-the-ghost-of-fcs>.

<sup>97</sup> Jen Judson, *US Army Chooses Competitors to Design Infantry Fighting Vehicle Replacement*, DEF. NEWS (July 23, 2021), <https://www.defensenews.com/land/2021/07/23/us-army-chooses-competitors-to-design-infantry-fighting-vehicle-replacement>.

<sup>98</sup> Sydney J. Freedberg Jr., *Army Boosts Big Six 26%, but Trims Bradley Replacement*, BREAKING DEF. (Feb. 10, 2020, 2:07 PM), <https://breakingdefense.com/2020/02/army-boosts-big-six-26-but-not-bradley-replacement>.

<sup>99</sup> U.S. GOV’T ACCOUNTABILITY OFF., GAO-20-579, NEXT GENERATION COMBAT VEHICLES: AS ARMY PRIORITIZES RAPID DEVELOPMENT, MORE ATTENTION NEEDED TO PROVIDE INSIGHT ON COST ESTIMATES AND SYSTEMS ENGINEERING RISKS 18–20 (2020) [hereinafter GAO-20-579].

<sup>100</sup> The publicly available information about the Navy’s acquisition planning for the medium unmanned surface vehicle is limited. Some assumptions and inferences about the program are made in discussing this case. This does not diminish the program’s usefulness as a case study since the program has still drawn congressional interest due to inadequate assessments of technological maturity and the associated risks to the program’s cost and schedule.

<sup>101</sup> RONALD O’ROURKE, CONG. RSCH. SERV., R45757, NAVY LARGE UNMANNED SURFACE AND UNDERSEA VEHICLES: BACKGROUND AND ISSUES FOR CONGRESS 1 (2020).

communications relay” in the fleet.<sup>102</sup> The technology supporting the MUSV is based on the Defense Advanced Research Projects Agency’s unmanned anti-submarine ship.<sup>103</sup> Specific details on the list of critical technologies and TRAs have not been released; however, public announcements have confirmed that the MUSV must be capable of “maneuvering autonomously and complying with international Collision Regulations, even in operational environments,”<sup>104</sup> integrating with the Navy’s “command and control (C2) solution . . . developed . . . for the [Large Unmanned Surface Vehicle (LUSV)] program,”<sup>105</sup> and capable of operating independently for at least sixty days.<sup>106</sup> This will likely require development of artificial intelligence for the autonomous maneuverability and integration with the command and control solution as well as development of propulsion systems that can operate away from normal maintenance support.<sup>107</sup> Rear Admiral Casey Morton, Program Executive Officer, Unmanned and Small Combatants, acknowledged, “While LUSV and MUSV may push the envelope, nothing entirely new is being created.”<sup>108</sup> The Navy’s approach to development and modernization has drawn criticism from Congress.<sup>109</sup>

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<sup>102</sup> Sam LaGrone, *Navy to Contract New Class of Unmanned Surface Vehicle by Year’s End*, USNI NEWS, <https://news.usni.org/2019/03/06/navy-contract-new-class-unmanned-surface-vehicle-years-end> (Aug. 14, 2019, 1:19 PM).

<sup>103</sup> O’ROURKE, *supra* note 101, at 15.

<sup>104</sup> *L3Harris Technologies Awarded Medium Unmanned Surface Vehicle Program from US Navy*, L3HARRIS TECHS. (Aug. 18, 2020), <https://www.l3harris.com/newsroom/press-release/2020/08/l3harris-technologies-awarded-medium-unmanned-surface-vehicle>.

<sup>105</sup> O’ROURKE, *supra* note 101, at 14.

<sup>106</sup> Sam LaGrone, *Navy Awards Contract for First Vessel in its Family of Unmanned Surface Vehicles*, USNI NEWS, <https://news.usni.org/2020/07/14/navy-awards-contract-for-first-vessel-in-its-family-of-unmanned-surface-vehicles> (July 15, 2020, 6:38 AM).

<sup>107</sup> Captain Pete Small, *Unmanned Maritime Systems Update*, at slide 4 (Jan. 15, 2019), <https://www.navsea.navy.mil/Portals/103/Documents/Exhibits/SNA2019/UnmannedMaritimeSys-Small.pdf?ver=2019-01-15-165105-297>; Megan Eckstein, *Navy Claims a Strong Technical Foundation Ahead of Testing New Classes of Unmanned Ships*, USNI NEWS (Sept. 9, 2019, 4:38 PM), <https://news.usni.org/2019/09/09/navy-claims-a-strong-technical-foundation-ahead-of-testing-new-classes-of-unmanned-ships>.

<sup>108</sup> Eckstein, *supra* note 107.

<sup>109</sup> *See, e.g.*, U.S. GOV’T ACCOUNTABILITY OFF., GAO-18-238SP, NAVY SHIPBUILDING: PAST PERFORMANCE PROVIDES VALUABLE LESSONS FOR FUTURE INVESTMENTS (2018).



Over the last decade, the Navy has struggled to develop and deploy new, state-of-the-art vessels.<sup>110</sup> Congress has attributed this to the Navy's failure to thoroughly understand and assess a given technology's maturity before incorporating it into a new vessel.<sup>111</sup> Congress has specific concerns with the Navy's LUSV.<sup>112</sup> The Senate Armed Services Committee report for the FY 2020 NDAA raised concerns with the Navy's approach to "design, technology development, and integration as well as a limited understanding of the LUSV concept of employment, requirements, and reliability for envisioned missions."<sup>113</sup> Those concerns have grown to include the MUSV. The FY 2021 NDAA imposed restrictions on the MUSV program that include testing and qualification of propulsion and electrical generation systems for 720 continuous hours without maintenance or repair, and congressional notification before contract award or the obligation of funds.<sup>114</sup>

The MUSV contract was awarded in July 2019; there had not been any reports of significant development delays, but in 2021 the contractor received a \$60.48 million contract modification for "continued engineering and technical support."<sup>115</sup> The Navy has expressed its confidence in relying on technology that has already been developed to unstated levels of maturity. The Navy has not confirmed whether it completed a formal TRA, but Congress's mandate in the FY 2021 NDAA to test certain systems suggests the Navy is relying on its familiarity with the critical technologies instead of a formal TRA. Captain Pete Small, Program Executive Office, Unmanned and Small Combatants, acknowledged there are a multitude of challenges the program will have to overcome to be successful, but noted "we're starting to procure these things, we're going into fabrication, they're going to start coming off the production lines soon, and we need to have

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<sup>110</sup> Paul McLeary, *Congress Pumps the Brakes on Navy, Demands Answers from OSD*, BREAKING DEF. (July 2, 2020, 11:46 AM), <https://breakingdefense.com/2020/07/congress-pumps-the-brakes-on-navy-demands-answers-from-osd>.

<sup>111</sup> H.R. REP. NO. 116-442, pt. 1, at 20 (2020).

<sup>112</sup> Paul McLeary, *Navy Awards Study Contracts on Large Unmanned Ship—As Congress Watches Closely*, BREAKING DEF. (Sept. 4, 2020, 5:46 PM), <https://breakingdefense.com/2020/09/navy-awards-study-contracts-on-large-unmanned-ship-as-congress-watches-closely>.

<sup>113</sup> S. REP. NO. 116-84, at 80 (2019).

<sup>114</sup> William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021, Pub. L. No. 116-283 § 122(b), 134 Stat. 3388, 3425–26.

<sup>115</sup> *MUSV Development Continues for L3Harris*, SHEPHARD MEDIA (July 7, 2021, 12:15 PM), <https://www.shephardmedia.com/news/naval-warfare/musv-development-continues-l3harris>.

solid plans to go employ them, test them and field them.”<sup>116</sup> The statements of Rear Admiral Morton and Captain Small suggest that the Navy rushed the start of the MUSV without fully assessing its technological requirements even though it is “push[ing] the envelope.”<sup>117</sup> This may have started the acquisition process sooner, but puts the program at serious risk for significant cost overruns and delays if there are any problems with maturing critical technologies. The next two programs have avoided these issues by utilizing early TRAs.

### 3. *Mobile Protected Firepower*

The mobile protected firepower (MPF) is an armored, direct-fire vehicle intended to support infantry brigade combat teams.<sup>118</sup> Though the Army originally developed this requirement through the JCIDS process, the program was approved for the MTA pathway in October 2018.<sup>119</sup> An independent TRA completed before the Army initiated the program found all of the required technologies were at or near maturity.<sup>120</sup> The GAO still considered the schedule proposed for the MPF program to be aggressive and that success would depend on the ability to utilize mature technology.<sup>121</sup> The GAO noted the integration of existing technologies as a potential cause for a lowered TRL score because it could change “the form, fit, or functionality of those technologies.”<sup>122</sup> To mitigate these risks, contractors “underwent design maturity reviews 6 months after contract award” to verify that the proposed technology remained at an acceptably mature level.<sup>123</sup> Having leveraged early TRAs to develop its requirements, the program has thus far proceeded within its budget, field-tested two prototypes, and is expected to begin production in June 2022.<sup>124</sup>

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<sup>116</sup> Megan Eckstein, *Navy Planning Aggressive Unmanned Ship Prototyping, Acquisition Effort*, USNI NEWS (May 15, 2019, 10:31 AM), <https://news.usni.org/2019/05/15/navy-planning-aggressive-unmanned-ship-prototyping-acquisition-effort>.

<sup>117</sup> *Id.*; Eckstein, *supra* note 107.

<sup>118</sup> DEFENSE ACQUISITIONS ANNUAL ASSESSMENT, *supra* note 64, at 107.

<sup>119</sup> *Id.*

<sup>120</sup> *Id.* at 108.

<sup>121</sup> *Id.*

<sup>122</sup> *Id.*

<sup>123</sup> *Id.*; GAO-20-579, *supra* note 99, at 27.

<sup>124</sup> Ethan Sterefeld, *Murray: One MPF Prototype Potentially Airdrop-Capable*, INSIDE DEF. (June 21, 2021, 4:22 PM), <https://insidedefense.com/insider/murray-one-mpf-prototype->

#### 4. Integrated Visual Augmentation System

The integrated visual augmentation system (IVAS) is an “augmented reality” system that “includes a heads-up display, sensors, [and] an on-board computer” to improve situational awareness and target acquisition.<sup>125</sup> The Army initiated the IVAS MTA rapid prototyping program in September 2018.<sup>126</sup> Two months later, the Army awarded a contract to Microsoft to develop the IVAS.<sup>127</sup> The program called for four prototype iterations to utilize Agile software development techniques, which incrementally expand capabilities in each iteration.<sup>128</sup>

Before issuing the solicitation, the Army conducted a TRA and identified fifteen critical technologies that it needed for IVAS to succeed.<sup>129</sup> The Army determined all fifteen technologies were mature or approaching maturity at program initiation.<sup>130</sup> The Office of the Under Secretary of Defense (Research and Engineering) disagreed, finding the technology supporting the display module too immature to support daytime use and limit “light emissions to ensure light security for night operations.”<sup>131</sup> The program took steps to mitigate the potential technology risks and is now has a contract with Microsoft worth up to \$21.88 billion to produce the IVAS.<sup>132</sup> Despite a delay in fielding due to low resolution at the edges of the field of view, the program remains on schedule.<sup>133</sup>

Programs with early TRAs were better positioned to develop and adhere to cost estimates and schedules because they had a firm understanding of the level of effort necessary to develop critical technologies. This avoided

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potentially-airdrop-capable; DEFENSE ACQUISITIONS ANNUAL ASSESSMENT, *supra* note 64, at 107.

<sup>125</sup> DEFENSE ACQUISITIONS ANNUAL ASSESSMENT, *supra* note 64, at 101.

<sup>126</sup> *Id.*

<sup>127</sup> *Id.*

<sup>128</sup> *Id.* at 18, 101–02.

<sup>129</sup> *Id.* at 102.

<sup>130</sup> *Id.*

<sup>131</sup> *Id.*

<sup>132</sup> *Id.* at 101–02; Sydney J. Freedberg Jr., *IVAS: Microsoft Award by Army Worth up to \$21.9B*, BREAKING DEF. (Mar. 31, 2021 4:08 PM), <https://breakingdefense.com/2021/03/ivas-microsoft-award-worth-up-to-21-9b>.

<sup>133</sup> Karen Saunders & Gen. John M. Murray, *Joint ASA ALT and AFC Statement on the Integrated Visual Augmentation System*, U.S. ARMY (Oct. 18, 2021), [https://www.army.mil/article/251258/joint\\_asa\\_alt\\_and\\_afc\\_statement\\_on\\_the\\_integrated\\_visual\\_augmentation\\_system](https://www.army.mil/article/251258/joint_asa_alt_and_afc_statement_on_the_integrated_visual_augmentation_system).

the root causes of failure: schedule delays, cost overruns, and congressional intervention.

#### IV. Mandatory Technology Readiness Assessments as a Method to Ensure Middle Tier of Acquisition Program Success

##### A. Early Technology Readiness Assessments Allow Middle Tier of Acquisition Programs to Avoid Development Problems Later

Conducting TRAs before initiation or in early program phases allows the development of realistic requirements based on the current state of technology. In 2007, the Under Secretary of Defense (Acquisition, Technology, and Logistics) acknowledged that programs have relied heavily on proposals from industry or white papers developed during research phases in making acquisition decisions.<sup>134</sup> These paper proposals typically do not have sufficient information to allow a realistic assessment of technical risk or to generate estimates for developing technology during the life of a program.<sup>135</sup> A complete understanding of a technology's maturity level is essential to generating these estimates.<sup>136</sup>

An early TRA would validate the maturity of the critical technologies that the program would likely incorporate into the system and challenge any misconceptions from paper proposals being used to define the program's requirements.<sup>137</sup> If the TRA indicates critical technologies are immature before program start, or early on, program managers have the flexibility to consider changes to the requirements, identify alternative technologies, develop plans to mature the necessary technology, or pursue a different pathway for the program.<sup>138</sup>

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<sup>134</sup> Memorandum from Under Sec'y of Def. (Acquisition, Logistics & Tech.) to Sec'ys of the Mil. Dep'ts et al., subject: Prototyping and Competition (19 Sept. 2007); U.S. GOV'T ACCOUNTABILITY OFF., GAO-17-309, WEAPON SYSTEMS: PROTOTYPING HAS BENEFITED ACQUISITION PROGRAMS, BUT MORE CAN BE DONE TO SUPPORT INNOVATION INITIATIVES 6-7 (2017) [hereinafter GAO-17-309].

<sup>135</sup> GAO-17-309, *supra* note 134, at 16.

<sup>136</sup> U.S. GOV'T ACCOUNTABILITY OFF., GAO-19-336SP, WEAPON SYSTEMS ANNUAL ASSESSMENT: LIMITED USE OF KNOWLEDGE-BASED PRACTICES CONTINUES TO UNDERCUT DOD'S INVESTMENTS 48-51 (2019) [hereinafter GAO-19-336SP].

<sup>137</sup> *Id.*

<sup>138</sup> GAO TECHNOLOGY READINESS GUIDE, *supra* note 12, at 87.

An early TRA can also enable more accurate cost estimates and reasonable program schedules. If a program intends to incorporate a technology with a low TRL score, then the design may have a flawed technical base.<sup>139</sup> The Future Combat System (FCS), part of the Army's first attempt to replace the M2 Bradley, is a prime example. The FCS program did not have "firm requirements and mature technologies, [and] its knowledge levels have consistently lagged behind its calendar schedule."<sup>140</sup> The Army did not know what the "network need[ed] to be, what may be technically feasible, how to begin building the network, and how to eventually demonstrate it" until five years into the program.<sup>141</sup> An overabundance of immature technology in the program meant development funds were spread thin.<sup>142</sup> An early TRA can avoid incorporating an abundance of immature technologies, as happened with the FCS program, so programs can focus funds and resources on truly critical technologies.<sup>143</sup>

Finally, both the GAO and the Congressional Research Service frequently report to Congress that shifting requirements and lengthy development of immature technologies have delayed programs.<sup>144</sup> Early TRAs will enable senior DoD officials to better defend individual MTA programs and the implementation of the MTA pathway when questioned by Congress. With the benefit of a TRA report, DoD leaders can outline the steps taken to evaluate proposed technology, how technological maturity influenced requirement validation, and how the necessary technology has developed since program initiation. By demonstrating a more thoughtful approach to initiating MTA programs, the DoD can avoid the budgetary uncertainty and risk of program failure that come with congressional intervention.

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<sup>139</sup> GAO-19-336SP, *supra* note 136.

<sup>140</sup> GAO-08-408, *supra* note 70, at 9.

<sup>141</sup> *Id.* at 11.

<sup>142</sup> GAO TECHNOLOGY READINESS GUIDE, *supra* note 12, at 49.

<sup>143</sup> *Id.*

<sup>144</sup> See FEICKERT, *supra* note 66, at 13; GAO-08-408, *supra* note 70, at 3. The Congressional Research Service's mission is to "serve Congress with the highest quality of research, analysis, information and confidential consultation to support the exercise of its legislative, representational and oversight duties in its role as a coequal branch of government." *History and Mission*, LIBR. OF CONG., <https://www.loc.gov/crsinfo/about/history.html> (Sept. 16, 2021).

## B. Potential Barriers to Conducting Early Technology Readiness Assessments

There are potential barriers to incorporating TRAs into the early stages of a program or pre-initiation. Unlike MCAs, MTA programs have a rigid suspense date. With waivers of the five-year limitation withheld to the USD(A&S), time is a precious commodity.<sup>145</sup> Programs already subject to a range of “statutory, regulatory, and Service-level oversight needs” may struggle to meet timelines when faced with additional bureaucratic requirements.<sup>146</sup> While time restraints are a legitimate concern, a TRA does not have to negatively impact the schedule. “When planned and executed well, TRAs are complementary to existing program management activities, system development efforts, and oversight functions . . . .”<sup>147</sup> The timeline for an MTA program begins once the decision authority approves the program for the MTA pathway. Even a lengthy TRA process would not affect the timeline if completed before program initiation. For programs like the optionally manned fighting vehicle, which lost a year of development and 11.1% of its budget, the additional cost and time spent on an early TRA would be preferable.<sup>148</sup> Finally, reliance on established technology may lure program managers and approval authorities into believing that a TRA is not necessary. Utilizing mature technology can still introduce unexpected development costs, schedule delays, or performance issues if applied in new ways or new environments.<sup>149</sup>

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<sup>145</sup> DoDI 5000.02, *supra* note 5, para. 1.2(c).

<sup>146</sup> JEFFREY A. DREZNER ET AL., RAND CORP., ISSUES WITH ACCESS TO ACQUISITION INFORMATION IN THE DEPARTMENT OF DEFENSE 14 (2020); Scott Maucione, *DoD Releases Long Awaited Policy on Mid-Tier Acquisition*, FED. NEWS NETWORK (Jan. 3, 2020, 3:44 PM), <https://federalnewsnetwork.com/contracting/2020/01/dod-releases-long-awaited-policy-on-mid-tier-acquisition>.

<sup>147</sup> GAO TECHNOLOGY READINESS GUIDE, *supra* note 12, at 18.

<sup>148</sup> DoDI 5000.80, *supra* note 4, glossary; Freedberg, *supra* note 98.

<sup>149</sup> GAO TECHNOLOGY READINESS GUIDE, *supra* note 12, at 48; GAO-17-309, *supra* note 134, fig.5. The joint light tactical vehicle was supposed to include mature or almost mature technologies; however, concerns about the feasibility of combining these technologies required an expanded technology maturity plan before development could begin. FEICKERT, *supra* note 50.

### C. Implementing Mandatory TRAs

Due to the limited window to complete an MTA program, program managers must have a realistic understanding of the technology being utilized for the program is. This is especially pertinent when developing a nearly complete system prototype, as tends to be the focus in the DoD.<sup>150</sup> Current policy guidance does not require a TRA in an MTA program. As the case studies have shown, allowing programs to delay or omit the TRA can have significant repercussions. To avoid this issue, USD(A&S) should adjust the current policy to require that all MTA programs complete a TRA before program initiation.

Paragraphs 3.1(b) and 3.2(c) of DoD Instruction 5000.80 outline the requirements for acquisition and funding strategies for rapid prototyping and rapid fielding programs.<sup>151</sup> The USD(A&S) could mandate TRAs for program initiation by adjusting language already in these paragraphs to read: “DoD Components will develop a process to implement acquisition and full funding strategies for the program. This process will result in an acquisition strategy, which includes security, schedule and production risks, [technical readiness evaluation results,] and a cost estimate.”<sup>152</sup> The DoD should also adjust Table 1, entitled “MTA Entrance Documentation Deliverables,” to require the acquisition strategy for major and non-major systems to make it clear that TRAs are required for both.<sup>153</sup> This may delay the start of an MTA program, but programs would maintain the ability to scale the TRA to the complexity of the technology being considered while avoiding additional costs and delays from unexpected technology development problems.<sup>154</sup>

The MTA pathway uses tailored procedures for each program; however, baselines are still necessary to ensure programs accomplish their goals. Due to the limited window for completion of an MTA program, utilization of immature technologies should be closely supervised. With TRAs mandated for all MTA programs, the USD(A&S) should require any program that intends to use a critical technology below TRL 6 to notify the next higher approval authority. Under the current policy, the Assistant Secretary of the

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<sup>150</sup> Eric Spero et al., *The Importance of Early Prototyping in Defense Research, Engineering, Acquisition, and Sustainment*, 7 DSIAC J., no. 2, 2020, at 46, 51.

<sup>151</sup> DoDI 5000.80, *supra* note 4, paras. 3.1(b), 3.2(c).

<sup>152</sup> *Id.*

<sup>153</sup> *Id.* at 10 tbl.1.

<sup>154</sup> The average time to complete a technology readiness assessment changes based on the complexity of the technology and the intended use of the information. GAO TECHNOLOGY READINESS GUIDE, *supra* note 12, at 39–43.

Army (Acquisition, Logistics and Technology) is the approval authority for Army MTA programs under the MDAP threshold.<sup>155</sup> The next higher authority would be the USD(A&S).<sup>156</sup> Implementing the notification requirement with the USD(A&S) would ensure that even smaller programs are utilizing sufficiently mature technology or have detailed plans to mature critical technologies before program initiation. This can be accomplished by adding a new paragraph, between paragraphs 4.1(c) and 4.1(d), that reads: “Any MTA program expected to include technology with a Technology Readiness Level score of 5 or below at program initiation requires written notice to USD(A&S).” The proposed language would ensure that TRAs are completed DoD-wide for MTA programs and promote the rapid nature of these prototyping and fielding programs.

## V. Conclusion

The MTA pathway has the potential to improve the quality and speed of defense acquisitions significantly. Adaptability, flexibility, and streamlined procedures allow MTA programs to meet unique requirements on a far shorter timeline than traditional MCA programs permit. While moving with deliberate speed is the key to success for the MTA, programs cannot build realistic requirements unless they ascertain the current state of needed technologies. Realistic requirements, schedules, and costs for achieving them can be developed by taking the time to assess the maturity of critical technologies at or before program initiation. Programs that have taken the extra time to conduct an early TRA have experienced smoother development and been able to achieve the intended rapidity of the MTA pathway. The programs that have not conducted an early TRA have stumbled through delays and incurred additional costs. Congress expects competent use of the MTA pathway, and the warfighter deserves modern systems and capabilities that ensure overmatch against any enemy. Early TRAs may necessitate a slower start to the program, but they will ensure the program runs smoother—which is ultimately faster.

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<sup>155</sup> National Defense Authorization Act for Fiscal Year 2016, Pub. L. No. 114-92, § 804(c)(4)(F), 129 Stat. 726, 884 (2015); ASA(ALT) Policy Memo, *supra* note 59, para. 4a.

<sup>156</sup> Approval from USD(A&S) is already required for MTA programs that exceed the MDAP threshold. DoDI 5000.80, *supra* note 4, para. 2.1(b).