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Demo to Deployment in 30 Days: The ARMS Case Study

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Demo to Deployment in 30 Days: The ARMS Case Study

Matthew Cole—is a Technical Project Manager at NSWC PHD, with a portfolio focusing on rapid development and readiness technology. He has a BS in Aerospace Engineering from MIT (2015) and an MA in Defense and Strategic Studies from the U.S. Naval War College (2024). From January 2025 to present, he served as the Project Manager for the Augmented Reality Maintenance System (ARMS). [matthew.d.cole14.civ@us.navy.mil]

Nicholas Bernstein—is a Research and Development Engineer in NSWC PHD's Office of Engineering. His background in neuroscience, biomedical engineering, computer science, and systems engineering has informed contributions to various Navy projects involving data analysis, augmented reality, and distance support. From 2022 to present, he served as NSWC PHD's Augmented Reality Maintenance System (ARMS) Engineering Lead, working with NAWCAD Lakehurst to mature the system towards deployment readiness. [nicholas.r.bernstein.civ@us.navy.mil]

Abstract

In February 2025, Augmented Reality Maintenance System (ARMS) had a shipboard demonstration of its remote technical assistance capabilities. Video of the demonstration made its way to critical leaders across Systems Commands (SYSCOMs), and the ARMS team at Naval Surface Warfare Center Port Hueneme Division (NSWC PHD) was asked to field the system across a Carrier Strike Group within 30 days. Over the next month, the ARMS team overcame every programmatic and policy barrier to deploy an integrated, accredited, and capable system into the hands of the warfighter. This achievement was made possible through a variety of prototype and technology acceleration authorities, including creative contracting strategies, Non-Permanent Change (NPC) alteration status, the Fleet Risk Acceptance process, and an Urgent Deployment Test (UDT) Interim Authority to Test (IATT). The volume of necessary workarounds reveals several insights about technology transition in the U.S. Navy; namely, criticality of high-level advocacy, relationships with key Fleet staff, shipboard integration expertise, emergent labor funding, and flexible procurement options. This paper offers a case study of the ARMS rapid deployment effort, intended as a resource for acquisition professionals and an example of how a program can successfully innovate by trading risk for speed.

Introduction

In the modern security ecosystem, "innovation" is frequently presented as both a watchword and an unalloyed good. The Trump administration references innovation as a core national objective in both the National Security Strategy (NSS; The White House, 2025) and the National Defense Strategy (DoW, 2026), as well as several key executive orders[1]. And for all the changes that the Trump administration has brought to the Department formerly known as Defense, this topic is notable for its continuity with the Biden Administration, which spoke of innovation in no less glowing terms in the former 2022 NSS (The White House, 2022).

To the national security establishment, innovation is primarily a matter of speed. Relatively modest increments of capability can be considered "innovative" if they are delivered fast enough to make a difference to the mission, and transformative, generation-defining programs are frequently considered innovation failures when they are delivered slowly or late. Acquisition professionals accustomed to making trades in the cost-schedule-performance decision space will recognize this paradigm as one in which schedule reigns supreme. But understanding the need to prioritize schedule in theory and achieving acquisition speed in practice can be quite different, owing to the wide breadth and depth of pitfalls that await the

[1] See for example, "Removing Barriers to American Leadership in Artificial Intelligence" (Exec. Order No. 14179) and "Modernizing Defense Acquisitions and Spurring Innovation in the Defense Industrial Base" (Exec. Order No. 14265).

unwary Program Manager, especially in the last tactical mile of delivering capability to the Fleet. To paraphrase Clausewitz, everything is very simple in deployment, but even the simplest thing is hard.

To assist Program Mangers in that endeavor, this paper presents the case study of a single, highly successful attempt to deliver a modest capability to the fleet at maximum speed: the Augmented Reality Maintenance System (ARMS), which successfully accomplished an emergent, leadership-directed deployment across a battlegroup approximately 30 days after a successful technical demonstration.

There are limits to the value of any single case study in acquisition, because every acquisition system has a unique technical and programmatic posture. ARMS is no different, and many of the barriers and solutions applicable to ARMS may not extend to other systems. But by offering a complete, end-to-end account of how each of these barriers was identified and resolved, it is our hope that other acquisition professionals will be better equipped to address similar barriers in the future, even if they are different in the specifics.

This case study will be structured in three parts. In the first part, a basic timeline and description of activity will be provided, illustrating the history of ARMS and the key events over the course of the 30-day ARMS transition window. The second part will analyze the timeline by identifying what we view as the primary barriers, the solutions that were employed to resolve those barriers, and the key enabling factors that facilitated those solutions. Finally, the third part will provide discussion of the case study, crystalizing what we offer as the most salient lessons and recommendations for practitioners.

Case Narrative

Inception To Technology Demonstration

The fundamental problem that ARMS was developed to solve is the extreme delay and expense associated with sending Subject Matter Experts (SMEs) in person to deployed U.S. Navy ships, a process known as “On-Board Technical Assistance” or OBTA. The goal of the development work that culminated in ARMS was to offer an alternative that improved upon traditional distance support by phone and email, something that we have previously described as Remote Technical Assistance (RTA; Cole et al., 2025).

Initial development of the technology that would become ARMS was slow, steady, and sometimes meandering. Development, testing, and maturation of the tool on a technical level was a multi-year effort across Navy System Commands (SYSCOMs) with multiple failures and significant changes. Development of the core software of ARMS began in 2018 by Naval Air Warfare Center Aircraft Division (NAWC AD) Lakehurst’s (LKE) Collaborative Research, Engineering, Analysis, and Training in Immersive Virtual Environments (CREATIVE) Lab as part of a Naval Innovative Science and Engineering (NISE) challenge. Then named the Collaborative Augmented Reality Maintenance Aid (CARMA), the tool streamed audio and video between a Windows laptop and a standalone augmented reality (AR) headset. The chosen AR headset was a self-contained device that provided all the power, computation, and user interface necessary for a deployed maintainer to broadcast and receive real-time data streams with a remote SME. The SME, operating the software on a standard Navy asset, could advise the sailor while being virtually co-located in the same room.

In 2019, on the other side of the country and in another SYSCOM, NSWC PHD sought technology that could benefit the sustainment community with current logistical difficulties impacting distance support today and into the future. Many In-Service Engineering Agents (ISEAs) spend much of their time traveling to perform OBTA visits around the world. The following year, the COVID-19 pandemic greatly restricted travel of SMEs, slowing necessary

OBTAs globally. LKE's distance support tool, now called Augmented Reality Remote Maintenance Support Service (ARRMSS), participated in the 2021 Advanced Naval Technology Exercise (ANTX)–Coastal Trident exercise; the distance support capability used PHD's self-defense test ship as a demonstrative underway platform for a proof of concept ship-to-shore remote expert call. What would soon be renamed once more to ARMS proved the capability for remote users to communicate between lab sites and across miles of ocean.

Many years earlier, NSWC PHD had prototyped a similar real-time distance support tool which, while mobile, had a much larger footprint; the bulky Distance Communications Maintenance System (DCoMS) provided a similarly valuable capability as ARMS but required the sailor to carry a backpack holding approximately fifty pounds of gear. Recognizing the need but the significant advancement ARMS represented due to reduction in size for the distance support concept, NSWC PHD quickly partnered with LKE to mature and field the system. Soon after, Program Executive Office Integrated Warfare Systems (PEO IWS) Program Executive Officer RDML Seiko Okano, aware of the potential impact of remote technical assistance in remote regions, provided funding to deploy the tool on active Navy platforms.

The next few years led to several shifts in technological approach as the realities of system integration came into full view. Despite the fact ARMS was built with Navy use cases and network considerations in mind, the chosen AR headset proved incapable of fully integrating with Navy shipboard networks or fully complying with all relevant Security Technical Implementation Guides (STIGs), a requirement for authority to operate (ATO) approval (DoD, 2022). Several lab-based tests and fleet exercises were successful to certain degrees, but full shipboard integration on active Navy ships and networks was invariably blocked from full functionality for one reason or another. The AR headset's operating system was simply unable to pass cybersecurity muster. Further, no commercial headset alternatives had the features required or developmental longevity to warrant long-term technological investment. As a result, the team continued to test the headset ARMS version while concurrently developing a laptop-based alternative using smart glasses peripherals instead of a self-contained AR device.

Despite these barriers to fielding the form factor, the AR headset version of ARMS was installed on three ships for short-duration testing using an interim authority to test (IATT) and limited ship change document (SCD) for a non-permanent change (NPC). One ARMS demonstration performed on the USS Spruance was recorded and passed on to then-RADM Seiko Okano, now Commander of Naval Information Warfare Systems Command (NAVWAR). RADM Okano was concerned about NAVWAR's ability to support the USS Nimitz and accompanying escort Destroyers (collectively "Carrier Strike Group" or "CSG") during that ship's final deployment prior to expected decommissioning. Seeing ARMS as a potential lifeline for the CSG, RADM Okano formally requested that NSWC PHD deploy an operational variant of ARMS across all the ships in the battlegroup prior to their deployment, roughly 30 days later.

Technology Demonstration to System Deployment

There was significant debate within NSWC PHD about whether the timeline was feasible. While the underlying software had a lengthy development history, the operational, ship-ready system that RADM Okano requested simply did not exist. The hypothesized laptop-based replacement configuration had never been assembled in sufficient quantity to outfit an entire CSG. Even if it had, that new configuration would lack the necessary cybersecurity approval to authorize its use on a ship, and the shore-based infrastructure needed to consummate the ship connection was due to be shut down within the month. And even ignoring all technical concerns, the procedural requirements associated with authorizing and accomplishing an installation on a U.S. Navy ship alone would have made the timeline tight enough to raise eyebrows. The decision to proceed with the attempt, directly authorized by NSWC PHD Commanding Officer

CAPT Anthony Holmes, was made with the acceptance of risk and the knowledge that success was by no means a forgone conclusion.

The first and most immediate challenge was the fact that there was no budget to support this emergent, unfunded requirement. This challenge was resolved through the immediate reprioritization of NSWC PHD NISE funds. Because of its flexibility, NISE could be used to fund government labor across the warfare center (including, critically, travel and overtime), allowing for the immediate activation of a half dozen branches with critical functions including cybersecurity, installation oversight, availability planning, configuration management, and technical documentation. NSWC PHD's primary role as the ISEA for most surface Navy combat systems was crucial in this regard. In business terms, NSWC PHD possessed an organic, vertically integrated capacity to perform almost all parts of the technology deployment process for in-service ships. The combination of a flexible funding source with this in-house vertical integration was one of the decisive factors in enabling rapid ARMS fielding.

The second immediate challenge was coordination across this wide array of disparate branches. This was accomplished through two means: first, the centralization of project management authority under a single Project Manager (PM), and second, a remarkably flat organizational structure, depicted in Figure 1. Daily, high-level project meetings provided a consistent drumbeat of updates, allowing for maximally dynamic schedule updates.

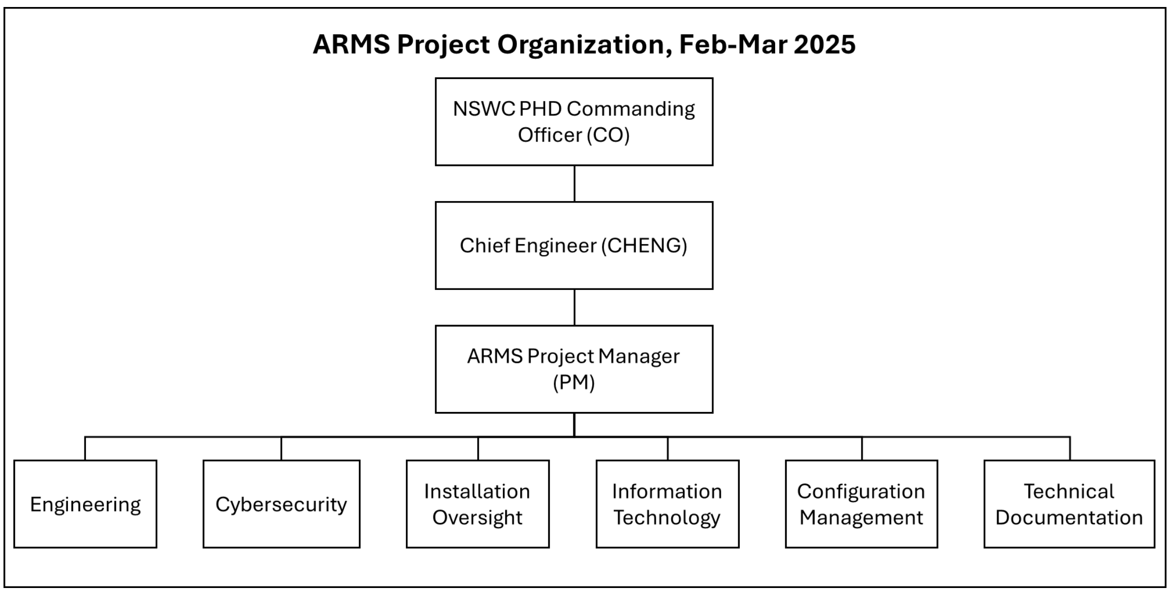

Figure 1. ARMS Team Organizational Chart

This highly central, highly flat organizational structure allowed for parallel execution of the many subtasks needed to execute ARMS fielding across the USS Nimitz CSG. The major subtasks and the relationships between them are depicted in Figure 2.

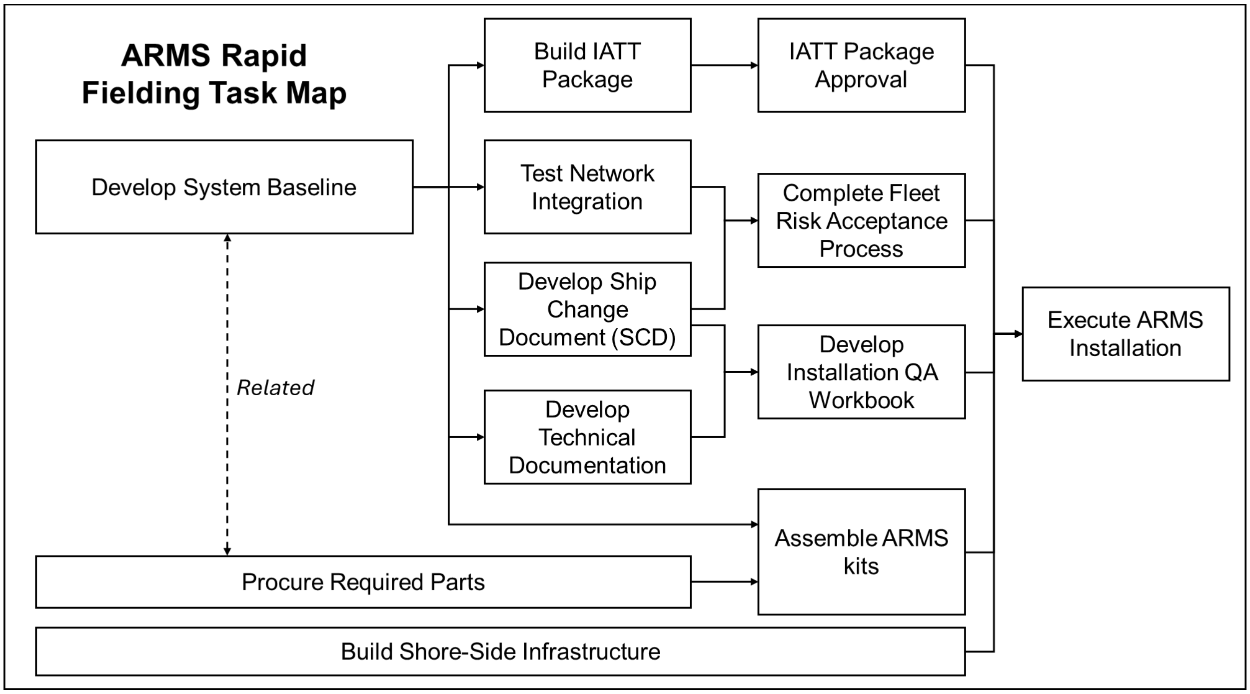

Figure 2. ARMS Fielding Tasks and Relationships

The single most critical and longest lead subtasks respectively were the development of the system baseline and the procurement of required parts. These two tasks were related, because the system baseline consists of both the hardware and the software components, and to the extent that the team needed to make hardware substitutions to account for delivery timelines, those substitutions would have to be determined before the baseline could be finalized. Procurement was an especially steep challenge, because the deployment timeline precluded the use of even the fastest Government mechanisms, like Purchase Cards and Defense Logistics Agency (DLA) Troop Support. Fortunately, NSWC PHD had a flexible contract in place with a vendor that had been pre-funded with NISE dollars in anticipation of emergent needs, and this allowed for the acquisition of short-lead material on a much-accelerated timeline. But even the vendor could not accelerate the delivery of the long-lead laptops. To acquire these assets, NSWC PHD requested assistance from Program Management Aviation (PMA) 260, a Naval Air Systems Command (NAVAIR) program office that fields a similar device as a preventative maintenance aid for U.S. Navy aircraft maintainers. PMA 260 generously provided enough units from their existing stock to cover the USS Nimitz CSG deployment.

The software baseline was also a challenge to finalize. The ARMS client software was finalized and tested, but to deploy a full-up-round system, it would need to be loaded onto a hardened Operating System (OS) capable of passing the rigorous battery of cybersecurity tests needed for an operational IATT. After considering several options, the team elected to build the OS from the ground up, leveraging a Secure Host Baseline (SHB) previously maintained by the Defense Information Security Administration (DISA). This resulted in a stand-alone system stripped down to the bare minimum software needed to function, reducing cybersecurity risk at the cost of functionality. While not necessarily ideal, this compromise was deemed to present less schedule risk than the alternative approach, which could have extended the IATT approval timeline with additional rounds of review and correction.

To achieve the required IATT approval within the 30-day deployment window, the team relied on a new type of IATT specifically intended to support rapid fielding, called an Urgent Deployment Test (UDT). This type of IATT requires that the system be used in support of an operational unit rather than purely for research and development and requires a written endorsement from a flag-level officer. RADM Okano provided the required endorsement for ARMS, making the deployment timeline at least feasible. But it still took a heroic effort from the NSWC PHD cybersecurity team and in-house validators to create and submit the IATT package in the required system to route it for approval. Even then, full approval was not obtained until the very final hour of the ARMS installation window, almost literally.

Once the ARMS system baseline was established, the next most critical task was network integration. For ARMS to be usable on the shipboard network present on U.S. Navy carriers and destroyers, it needed to be certified for use with Consolidated Afloat Networks and Enterprise Services (CANES). This testing was previously done for the ARMS headset configuration, but there was no guarantee that the old routing rules would still work with the new configuration without repeat testing. Fortunately, in the run-up to the rapid deployment window, the team was already working through the integration lab's approval chain to test the laptop-based alternative ARMS kit. Once in the lab, the NAVWAR team quickly applied previously established network configuration changes developed in the lead-up to the headset demonstration and confirmed operation of the new laptop-based ARMS kit, eliminating the single most important technical barrier to deployment.

To obtain authorization to install ARMS on US Navy ships outside of a designated availability window, the team chose to pursue the Fleet Risk Acceptance (RA) process. This process allows Fleet Commanders to authorize ship alterations that do not meet the traditional milestones for maturity dictated by the full Navy Modernization Process (NMP; Naval Sea Systems Command, 2021). The RA process is quite powerful, but it does present a few hard requirements. For one, the alteration seeking authorization must at least be documented by a SCD, even without maturity. It must also have an Authority to Operate (ATO) or IATT, there must be sufficient evidence that it will not negatively affect the network or the ship, and even the RA process does not exempt an alteration from complying with production requirements enforced by the Regional Maintenance and Modernization Coordination Office (RMMCO). But perhaps the most important prerequisites to effective use of the RA process are relationships and communication. If Type Commander and Fleet staff are not aware of the alteration, the justification, and the urgency, requests for RA are unlikely to succeed.

Accomplishing this constellation of requirements took the coordinated work of several teams. An NSWC PHD configuration management team built an SCD with inputs from engineering, while a technical documentation team worked with engineering to build a technical manual, training materials, and installation and verification procedures needed for the Quality Assurance (QA) workbook, a RMMCO requirement. With the SCD and supporting documentation in hand, an Availability Planning team handled the Naval Message traffic needed to initiate the RA process, and NSWC PHD embedded representatives at the Type Commander and Fleet staff were instrumental in socializing the urgency of the alteration. Collectively, we estimate that approximately two dozen Navy civilians and a handful of uniformed officers were directly involved in creating, reviewing, routing, and approving the paperwork required to authorize the ARMS installation.

The final prerequisite for accomplishing installation within the 30-day window was the necessity of setting up new shore-side infrastructure. The requirement from RADM Okano and CAPT Holmes was that the infrastructure support access by any relevant shore SME, including personnel at NAVWAR's facilities on both coasts, multiple Warfare Centers, and Regional Maintenance Centers (RMCs), including those in forward deployed locations, who have a critical role as first responders to Fleet technical issues. While the specific technical details employed by the ARMS team to meet these requirements are beyond the scope of this paper, the approach broadly involved leveraging the Research, Development, Test, and Evaluation (RDTE) networks present at and owned by NSWC PHD. By hosting certain components locally and utilizing peer network connections to remote sites with known and trusted protocols, the team devised a method for arbitrary SMEs to access ARMS without a requirement for locally installed software.

Finally, in the last days of March 2025, these many lines of effort collided in the first ever installation of the operational ARMS configuration aboard an active U.S. Navy ship. As a testament to the technical work, planning, and preparation completed in this short period, the team was able to successfully install the system of two Destroyers in a single day. By the end of the month, every ship in the CSG had been equipped with ARMS and tested satisfactory (apart from a leading deployer that had departed weeks sooner).

Post Deployment Developments

The reward for success in installing across the Nimitz CSG was a request to repeat the effort multiple times. In the year that followed, ARMS kits were built and installed on multiple carrier strike groups, amphibious ready groups, forward deployed ships, and ashore platforms. Approximately half the surface fleet—including destroyers, aircraft carriers, and amphibious ships—are now equipped with ARMS with more installations planned. Hundreds of shoreside SME accounts have been created. At time of writing, ARMS is estimated to have prevented 85.5 combined days of system downtime and saved 3,600 SME travel hours. The reduced SME travel and downtime have saved the Navy over $600,000. Even when ARMS cannot solve an issue through exclusively remote SME guidance, the advanced information allows the SME to travel with more information and the correct equipment needed to correct the issue. What's more, ARMS is challenging how maintenance is prioritized and performed across the organization because the system SME no longer needs to be physically present at the nearest port.

Analysis

Based on an analysis of the provided timeline, the experiences of the authors leading and executing the ARMS transition, and interviews with other personnel involved in the process, we have identified seven primary barriers that the ARMS program encountered and overcame during the 30-day Nimitz CSG deployment. These seven barriers are identified in Table 1.

Table 1. ARMS Barriers and Solutions

Barrier	Solution	Enablers
1. Urgent Labor Funding Requirements	Naval Innovative Science and Engineering (NISE) Funds	Leadership prioritization
2. Rapid Technology Adaptation	Standalone configuration	Available baseline, existing hardware BOM
3. Shipboard Network Integration	Network lab time, available network SMEs	DICE Lab, High level advocacy
4. Authority to Operate (ATO)	Urgent Deployment Test (UDT) Interim Authority To Test (IATT)	Flag endorsement, ISSE and validator support
5. Procurement	Flexible prepositioned funds, cross-program asset borrowing	NISE, PMA 260 support
6. Alteration Authorization	Non-Permanent Change (NPC) process, Emergent Change Process	Organic warfare center expertise and relationships with fleet and PMO
7. Production Requirements	Government AITM and OSIC support	Organic warfare center expertise

Urgent Labor Funding Requirements

To rapidly task the many personnel across several technical areas, the ARMS project needed access to a flexible source of funding for labor, travel, and overtime. This came in the form of NISE funds, a specialized type of overhead funding available to Department of Defense laboratories, including Naval Warfare Centers (10 U.S.C. § 4123). While NISE-funded projects typically run on an 18-month cycle from proposal to approval to execution, within NAVSEA, local control of NISE funding is sufficient to enable some degree of mid-year reprioritization based on emergent needs. This flexibility was exactly what the ARMS project needed at the crucial moment it was tasked to deliver. The key enabling resource to unlock NISE funds for this purpose was leadership prioritization, in this case that of CAPT Anthony Holmes, the NSWC PHD Commanding Officer.

Rapid Technology Adaptation

To adapt the effective but insecure pilot configuration into a secure, operational ARMS system, the team had to re-evaluate what form factor could best deliver the ARMS software while meeting security requirements. The critical breakthrough was the decision to build a stand-alone laptop configuration with a Defense Information Systems Agency (DISA) secure host baseline (SHB) for the Windows installation. Further, this kit included a small carrying case, headphones, webcams, and smart glasses. The smart glasses provided some limited AR capability but primarily provided a hands-free display for the maintainer and a camera feed back to the remote expert. Concurrently with the ongoing shipboard testing of the AR headset leading up to the USS Spruance demo, this known-good hardware was conceived and assembled to support shipboard network integration testing.

The key enabling resources for this solution were the fact that the team had already investigated and developed a notional Bill of Materials (BOM) for a laptop-based kit prior to tasking and the availability of a suitable SHB. This latter enabler is notable because with the sunset of the Windows 10 operating system, available SHBs will no longer meet cybersecurity requirements. Future systems may have more difficulty rapidly meeting cybersecurity requirements without inheriting controls from the host network, increasing integration complexity.

Shipboard Network Integration

Given the reliance of modern warships and systems on advanced IP-based internal networking, network integration is often the single most important technical barrier for any shipboard system that requires a direct IP-based connection, and network certification is one of the most important non-technical barriers. In general, the lead time to enter the simulated shipboard network lab and certify a new system can be nearly a year. The ARMS team was able to complete lab-based certification testing within 30-day deployment window only because of a few decisive factors: an in-progress lab entry request, previous relationships, and established technical artifacts.

First, at the start of the 30-day window, the request to test alternative laptop-based kit was already submitted and reviewed at several layers of the intake process; the system was, despite a change in hardware, largely the same in how it interfaced with the shipboard network and represented a fairly small hardware deviation for lab cyber reviewers. Secondly, the team knew who could assist in expediting the final review stages of the lab entry request and expressed the urgency of the installation schedule; although no cyber scrutiny was bypassed, the requests weren't subject to the usual review windows. Finally, because the team had spent several weeks spread over the previous few years in the integration lab testing multiple ARMS iterations, the bulk of configuration changes necessary for the laptop-based kit were known. By learning what didn't work from past attempts, the team was able to make the most of allocated lab time. Additionally, the history of ARMS troubleshooting leading up to the successful USS

Spruance demo using the AR headset informed the downstream network configuration changes necessary for proper data transport.

The key enabling resources that facilitated this solution were the availability of the network test lab during the period required and the availability of high-level advocacy to prioritize ARMS for that lab time.

Authority to Operate

The process to obtain an Authority to Operate (ATO) within the Department of the Navy's Risk Management Framework (RMF), including an IATT, is a notoriously lengthy process. In fact, this barrier would have single-handedly rendered the Nimitz deployment timeline infeasible if not for the availability of a specialized, expedited process called an Urgent Deployment Test (UDT). As described above, this IATT variation requires that the system be intended for operational use, and that it receive endorsement from a flag-level officer or civilian equivalent. For systems capable of meeting those bars, the UDT IATT may be an appealing choice to facilitate rapid deployments. To expedite this variation, the ARMS team socialized the request early with Information Systems Security Engineers (ISSE) and key validators.

Procurement

When Department of the Navy (DoN) programs require procurement on accelerated timelines, there are several feasible options that offer significantly greater speed than traditional contracts under the Federal Acquisition Regulations, including Government Purchase Cards and the Defense Logistics Agency (DLA) Troop Support. But the ARMS project found that all these options typically result in material delivery approximately 30–60 days after the identification of need after accounting for administrative delay. Options for procurement when material is needed in the 0–30 day window are significantly more limited. Fortunately, ARMS was able to leverage an existing contract that NSWC PHD held with a vendor for rapid prototyping support. Using prepositioned NISE funds, this contract allowed the vendor to procure the needed components on NSWC PHD's behalf. This contract proved to be fast enough to procure the needed short-lead kit components in time for deployment.

For the long-lead laptops, other methods were required. In the end, the team determined that the only feasible method to acquire enough suitable, ruggedized laptops was to borrow them from another DoN partner. These were graciously provided from the stock of PMA 260, NAVAIR's program office for Common Aviation Support Equipment. Support from PMA 260 was the critical enabler that allowed the ARMS team to obtain the material needed to outfit the Nimitz CSG.

Alteration Authorization

As a matter of normal business under the Navy Modernization Program (NMP), alterations to in-service ships are documented by SCDs and performed during Selected Restricted Availabilities (SRAs). This process is documented in the NMP Management and Operations Manual (NMP-MOM), which spans 943 pages and includes 9 appendices. For urgent, safety or mission-driven alterations requiring installation in 45 days or less, the Emergent Change Process offers a much faster alternative that allows the alteration to be matured in parallel with (in practice, typically after) execution of the alteration. The emergent change process was the primary procedural vehicle that ARMS leveraged to authorize installation within the 30-day Nimitz CSG install window, in conjunction with a Non-Permanent Change (NPC) SCD.

To overcome this barrier, the ARMS team brought to bear two key enablers: organic expertise at NSWC PHD in the NMP and existing relationships with Type Commander and Fleet Commander staff. The fleet relationships were particularly important, because endorsement and authorization from these actors are required for the emergent change process. Early socialization with the fleet is key to achieving risk acceptance and authorization.

Production Requirements

To execute on an in-service ship, all alterations regardless of authorization mechanism must be approved by the Regional Maintenance and Modernization Coordination Office (RMMCO). RMMCO acts as a gatekeeper to ensure that the teams performing alterations meet the requirements to execute safely and in accordance with U.S. Navy standards, with appropriate oversight. Most RMMCO requirements are met by compiling a QA Workbook, typically a physical binder that contains all the documents, personnel certifications, signature pages, references, and other information needed by RMMCO.

The ARMS team was able to overcome this barrier by leveraging organic capability within NSWC PHD, specifically Alteration/Installation Team Manager (AITM) and On-Site Installation Coordinator (OSIC) support. Because NSWC PHD performs a large volume of ship alterations (over 400 annually), the team was able to rapidly build the required QA workbook from existing templates, and leveraged existing, certified, and experienced waterfront personnel.

Discussion and Recommendations

The Importance of Maintaining Flexibility in Funding

Because government agencies are under significant pressure to expend all their funds within strict periods of performance, there is a tendency by many organizations to plan often and early, even for funding types that would theoretically offer greater flexibility. While this surplus of planning reduces the risk of under- or over-spending, it also comes at the cost of limiting the ability for mid-period adaptation to support innovation and rapid technology transition. In the case of ARMS, incurring the risk of a mid-year NISE replan was a critical and necessary cost of responding rapidly to an emergent need for technology transition. One takeaway for acquisition professionals is that in limited and responsible ways, it may be prudent to actively avoid the temptation to over-plan or at least identify the slack available within the plan.

The Limitations of "Rapid" Procurement

The experience of ARMS points to a critical gap in options for programs requiring procurement of material in less than 30 days. By process optimization and an intense focus on reducing administrative delays to the minimum possible, it might be possible to shrink this window to perhaps 21 days. But the key takeaway for acquisition professionals is that any procurement needed on a "hyper-rapid" timeline simply cannot afford to start from scratch. The obvious solution is a specialized procurement contract with a vendor and prepositioned funding, similar to what ARMS leveraged for short lead items. But the best and sometimes only fallback strategy for a program manager in a pinch may be to phone another program with material already on hand. For individual acquisition professionals, this underscores the value of a robust professional network. For the enterprise, this underscores the value of shared data visibility to better equip the acquisition community with information about who may be able to help meet urgent critical needs.

The Criticality of Relationships and Advocacy

While so-called "bottom up" innovation that starts as a good idea at the working level can be a powerful source of transformation within an enterprise over time, it is worth noting that the ARMS team's rapid success was driven largely by the ability to leverage top-down support. RADM Okano's request to deploy for the Nimitz CSG functioned as a critical stimulus to kick start the rapid transition, and Capt Holmes's support unlocked the full potential of the warfare center tasked with executing it. RADM Okano also provided the required flag endorsement without which it would have been impossible for ARMS to receive an IATT, and as the Functional Authorizing Official (FAO), also served as signature authority on the IATT itself.

Fleet relationships were also essential for navigating the emergent change process, and for the coordination of execution logistics, there is no effective substitute for direct waterfront relationships with ships' crews. These relationships are difficult to forge in a hurry, and the success of the ARMS team owed primarily to the existing organic capabilities of NSWC PHD. For Acquisition professionals looking to break into this space, a transition partner with established fleet relationships may be a powerful asset.

Risks and Waivers

It is no exaggeration to suggest that rapid transition is predominantly an exercise in the acceptance of risk. The primary tool for accepting risk within the U.S. Navy is typically a "waiver" from the usual, lengthy process, which may take various forms depending on the process in question. ARMS used many waivers to accomplish rapid deployment, waiving requirements that varied from logistics product requirements to cyber controls to installation dates.

Waivers are a powerful and sometimes necessary tool, but they do have an important downside: the typical process always exists for a reason. Whether for safety, or cybersecurity, or interoperability, all the laborious layers of typical Navy review do important jobs for the fleet. Waiving a process, while expedient, also deprives the DoN of all the benefits of those layers of review. We suggest that in some areas, there may be additional opportunities to find a middle ground, allowing for faster outcomes without relinquishing all the benefits of full review.

Warfare Centers as Rapid Transition Agents

Naval Warfare Centers are Navy Working Capital Fund (NWCF) organizations that provide organic government capability across many functions for a variety of customers. They are considered Department of Defense Laboratories (10 U.S.C. § 4121) and have a mission that spans from Research and Development (R&D) to in-service fleet support. Warfare Centers function like internal contractors within the DoN, and their core work is to accomplish tasks that are either inherently governmental functions or not cost effective for external contractors to provide as a service (Naval Sea Systems Command, n.d.). One important distinguishing feature of Warfare Centers is that they only act as service providers, and do not directly receive congressional appropriations or have their own requirements.

As the example of ARMS illustrates, Warfare Centers bring a powerful set of tools under one roof, including integration and mission engineering, logistics, configuration management, technical documentation production, cybersecurity engineering, alteration/installation management and oversight, and project management. Consequently, Warfare Centers are uniquely well-positioned to help accelerate technology transition, with one important caveat: they cannot do it on their own initiative. It takes an external requirement (and frequently external funding) to stimulate a Warfare Center to assume the role of a rapid transition agent. Even then, there are limitations, because Warfare Centers may not be well-positioned to do some of the foundational engineering needed to mature technologies at lower readiness levels. But for acquisition professionals tasked with fielding already mature technologies to the fleet at maximum speed, Warfare Centers may prove to be especially valuable partners.

Conclusion

The challenges of program management within the DoN often give rise to a peculiar variant of the so-called Dunning-Kruger effect. Those who have never attempted to field a system to the fleet generally underestimate the difficulty and effort of doing so at speed. But by the same token, those who have tried and failed often succumb to a form of bureaucratic nihilism and assume that truly rapid deployment is impossible. The case study of ARMS refutes both biases.

To the uninitiated, the challenge of taking a system that accomplished a successful technology demonstration on one ship and deploying it to a handful more may seem trivial. The many technical and non-technical barriers ARMS confronted and overcame shows that this is not the case. Even the simplest, most mature system can expect to encounter similar roadblocks, often requiring the expertise of a wide array of experienced professionals to effectively resolve. Any acquisition professional attempting rapid technology transition should be clear eyed about the difficulty and cost associated with delivering at speed.

But the notion that processes like NMP or cybersecurity authorization simply cannot be accomplished quickly is outdated and wrong. As ARMS shows, with the right approaches and enabling factors, these barriers are not unmanageable. In particular, funding flexibility, high level advocacy, mature relationships with fleet stakeholders and other acquisition professionals, and responsible use of process waivers are key factors that can reduce friction and speed deployment.

Every program is always unique in the specifics. The barriers and solutions employed by ARMS to facilitate a 30-day deployment may be irrelevant or infeasible for the next system to attempt deployment on a similar timeframe. The process of identifying and overcoming barriers, however, is one that all program managers must master. ARMS offers one successful model for acquisition professionals to consider.

Appendix A: Acronyms and Abbreviations

Acronym / Abbreviation	Definition
AITM	Alteration/Installation Team Manager
ANTX	Advanced Naval Technology Exercise
AR	Augmented Reality
ARMS	Augmented Reality Maintenance System
ARRMSS	Augmented Reality Remote Maintenance Support Service
ATO	Authority To Operate
BOM	Bill Of Material
CANES	Consolidated Afloat Network and Enterprise Services
CARMA	Collaborative Augmented Reality Maintenance Aid
CREATIVE	Collaborative Research, Engineering, Analysis, and Training in Immersive Virtual Environments
CSG	Carrier Strike Group
DCoMS	Distance Communications Maintenance System
DISA	Defense Information Security Administration
DLA	Defense Logistics Agency
DoN	Department of the Navy
FAO	Functional Authorizing Official
IATT	Interim Authority To Test
ISEA	In-Service Engineering Agent
ISSE	Information Systems Security Engineer
LKE	Lakehurst

NAVAIR	Naval Air Systems Command
NAVWAR	Naval Information Warfare Systems Command
NAWC AD	Naval Air Warfare Center, Aircraft Division
NISE	Naval Innovation Science and Engineering
NMP	Navy Modernization Process
NMP-MOM	Navy Modernization Process - Management and Operations Manual
NPC	Non-Permanent Change
NSS	National Security Strategy
NSWC PHD	Naval Surface Warfare Center, Port Hueneme Division
OBTA	On-Board Technical Assistance
OS	Operating System
OSIC	On-Site Installation Coordinator
PM	Project Manager
PMA	Program Management Aviation
QA	Quality Assurance
R&D	Research & Development
RA	Risk Acceptance
RMC	Regional Maintenance Center
RMF	Risk Management Framework
RMMCO	Regional Maintenance and Modernization Coordination Office
RTA	Remote Technical Assistance
SCD	Ship Change Document
SHB	Secure Host Baseline
SME	Subject Matter Expert
STIG	Security Technical Implementation Guides
SYSCOM	System Command
UDT	Urgent Deployment Test

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Acquisition Research Program
Department of Acquisition, Finance, and Manpower
Naval Postgraduate School
555 Dyer Road, Ingersoll Hall
Monterey, CA 93943

www.acquisitionresearch.net