



Collaboration With the **Commercial Industrial Base**

**A Powerful DoD
Readiness Enabler**

Eleanor Shelton ■ Bill Kobren

THE 2018 NATIONAL DEFENSE STRATEGY identified rebuilding military readiness as we craft a more lethal Joint Force as one of three distinct lines of effort for implementation. Tackling such a daunting challenge will require a multipronged approach to address a range of maintenance and sustainment hurdles, including aging infrastructure, legacy systems and technology, and efficiency obstacles. Our Warfighters cannot guarantee mission success with weapon systems that are grounded, waiting for repair parts, backlogged due to dated maintenance facilities, or supported by key maintenance personnel who need training.

Shelton is the Partner Outreach Specialist for the National Center for Manufacturing Sciences, a technology consortium that accelerates the development and adoption of innovative manufacturing and technology capabilities. Kobren is the Director of the Logistics and Sustainment Center at the Defense Acquisition University.



The surest way to prevent war is to be prepared to win one. Doing so requires a competitive approach to force development and a consistent, multiyear investment to restore warfighting readiness and field a lethal force.

—2018 National Defense Strategy of the United States of America

With the military Services facing this seemingly insurmountable task—achieving improved product support maintenance, and sustainment readiness without increased resources—what’s the answer?

One solution among many to meet this challenge is to collaborate with the commercial sector defense industrial base and leverage both new and existing maintenance and sustainment-enabling technologies.

Commercial Off-the-Shelf Technology (COTS) as an Asset for Readiness

Historically, it can take years to develop, test, and adapt technology that directly addresses a sustainment need. Given the pace of technology change and the rapidly evolving threats we face, time is a luxury we simply do not have. The need for speed is so pressing that Congress enacted legislation and the Department of Defense (DoD) is implementing policies, processes, and procedures to facilitate quicker delivery with an eye toward concurrently improving readiness and reducing life-cycle costs.

But what if the DoD didn’t need to spend all those years developing new logistics, product support, and maintenance technologies? What if the DoD simply could adopt commercially available technologies that are already proven or rapidly developing?

In 1998 Congress and the DoD created the Commercial Technologies for Maintenance Activities (CTMA) Program. This Cooperative Agreement—administered through the National Center for Manufacturing Sciences (NCMS), and the Office of the Deputy Assistant Secretary of Defense—Materiel Readiness (ODASD-MR)—leverages already developed, commercially available, maintenance and sustainment technologies that can address an unmet readiness challenge. Software platforms, inspection technology, handheld equipment, asset-tracking abilities, and numerous other capabilities are all critical needs that could be solved by looking no further than commercial industry, which already uses these novel capabilities.

The CTMA Program also provides proven “out-of-the-box” solutions on maintenance and sustainment technology transition. How many times has technology been purchased, even after jumping through all the certification and testing hoops, only to have it not work as hoped? Wouldn’t it be advantageous to actually try a technology first to ensure that it does what it is meant to do? This way, rapid prototyping can take place with results that can be put to work immediately.



USS Maine (SSBN 741) in Dry Dock 4 at Puget Sound Naval Shipyard and Intermediate Maintenance Facility in Bremerton, Washington, June 2018.

U.S. Navy photo by Thiep Van Nguyen II

When customers buy a car, for example, companies sometimes offer a trial period. Drive it for the week-end—and if you don't like it, return it. Wouldn't it be a game-changer if the DoD could seek the same kinds of opportunities? It absolutely can do so in the product support, maintenance, and sustainment realm. The CTMA Program offers a unique option to "try it before you buy it." This program is designed to evaluate, demonstrate, and validate technologies in a collaborative environment where expertise from both the government and industry is brought together to adapt or modify existing, commercially available technologies to meet government needs and expectations.

In all cases, the end users are able to integrate the new technology in their work streams and determine for themselves if it makes them more capable, effective, efficient, safer, or less costly. If through the testing and demonstration phase the technology isn't right, it can either be modified to make adjustments or the government can move on. No harm, no foul. Significant investments and years have not been wasted because these technology demonstrations can be organized quickly. Contracts are executed at lightning speed, often within 45 to 90 days of submissions. In addition, the CTMA initiative partners are working concurrently with all stakeholders to identify requirements for integrating the capability into the maintenance and sustainment operations to ensure technology transitions for all successful demonstrations.

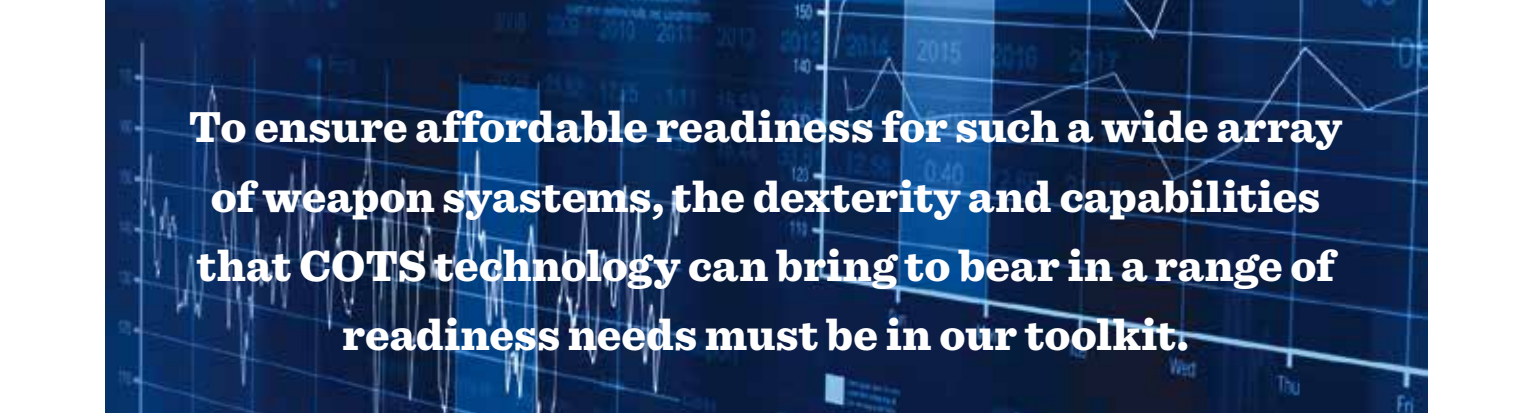
Why reinvent the wheel? Why spend years developing technology that soon will be obsolete? The DoD already has obsolescence challenges. Sustainment technology shouldn't be one of them.

Over the last 22 years, the CTMA Program has grown as government and industry worked together to collaboratively address readiness issues. Whether sustaining aircraft, ships, or tanks, the maintenance needs of all the military Services are far more similar than distinct—and in many instances more than one Service regularly participates in a CTMA project actively or as an observer. Results and best practices are shared to alleviate duplication of efforts and needless expenditures related to the "not invented here" mindset.

The DoD has identified several focus areas where streamlined sustainment activities are ripe for innovative COTS technologies. These include:

- Additive Manufacturing
- Autonomous Logistics
- Business Processes and Partnerships
- Predictive Maintenance and Condition-Based Maintenance Plus
- Coatings and Corrosion Prevention
- Advanced Electronics Maintenance
- Energy, Environmental, Health, and Safety
- Enhanced Non-Destructive Inspections
- Reliability Improvement (Hardware)
- Training and Miscellaneous

To emphasize the need for readiness, new congressional language was added to the National Defense Authorization Act in 2017, Section 806, which addressed Development, Prototyping, and Deployment of Weapons System Components or Technology. Among other imperatives, the statutory authorization today outlined in 10 United States Code 2447d provides the DoD with "mechanisms to speed deployment of successful weapons system component or



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technology prototypes.” Cooperative Agreements, such as the CTMA Program, are a viable vehicle to support this endeavor, particularly when they “address a high priority warfighter need or reduces the costs of a weapon system.”

Small Sustainment Efforts Deliver Significant Savings

So, what exactly does this mean in practical terms? Are there any successful real-world examples? The short answer is yes! Just a few examples include:

Expeditionary Fluid Analysis Capability (EFAC). This initiative was born from the sand and other debris degrading the lubricants in tactical vehicles in the 1991 Gulf War—Operation Desert Storm. Maintainers on the ground needed to find better a way to test lubricants in the field rather than sending samples to an approved laboratory and often waiting for days or sometimes longer for analysis results. This process resulted in critical vehicles parked and not mission ready. Concurrently, thousands of gallons of oil were wasted from unneeded oil changes completed on a predetermined calendar-based schedule. This unnecessarily costs labor hours and supply resources.

Leveraging the CTMA Program, the Office of the Secretary of Defense (OSD), along with the Joint Staff, the U.S. Army Combat Capabilities Development Command Data and Analysis Center, and several industry organizations with expertise in fluid analysis and deployment are working collaboratively to address the issue. The DoD, including the OSD, the U.S. Army, U.S. Navy, Marine Corps, and Air Force were briefed on several technologies available during a recent Industry Day. The government sponsor selected the technology that enabled the ground maintainer, at the point of service, to quickly and reliably determine whether a change was necessary—and select to test the one that appeared to best fit its needs.

By the evaluation’s conclusion, the yearly cost savings for the Marine Corps alone were estimated at \$3.2 million with 30,000 fewer labor hours. The Marines now are acquiring and integrating EFAC across applicable maintenance activities. Across the DoD, estimated savings could potentially be as high as 1,340,426 labor hours per year and a return on investment of more than \$21 million. An important benefit of using less oil is reduced environmental impact.

Intermittent Fault Detection Inspection System (IFDIS).

According to the Joint Intermittent Testing Working Integrated Product Team established by the OSD, the DoD spends an estimated \$2 billion yearly in detecting and isolating faults in aircraft wiring bundles and Weapons Replaceable Assembly (WRA)/Line Replacement Units (LRU). These faults include opens and shorts, degraded and intermittent signals, and insulation degradation. The magnitude of the challenge is daunting, with the DoD spending approximately billions annually removing and replacing WRAs/LRUs that, when tested, are determined to be “no-fault-found” (NFF). Additionally, legacy electronic components experience increasingly reduced reliability as a result of component age and usage.

This is an unpredictable situation for a technician who is trying to diagnose an electrical intermittency problem in a complex system of continuity paths. The intermittency event could occur on one or more of thousands of potential circuits, with a disruption duration measured in nanoseconds, and occurring by chance in time, or possibly not failing at all while the technician actively looks for it.

With an unacceptable number of aircraft grounded, solving this important wiring issue was increasingly important. Both the F-16 and F-18 (among other aviation weapon system platforms) experienced intermittent circuitry issues that grounded many of them. Moreover, the current technology was unsuited for portability, which was a critical need when looking for faults on aircraft operating at Forward Operating Bases or on board aircraft carriers. Several companies already had available wiring fault-detection capabilities, and one stood out with a technology adaptable to fit the unique needs of the Air Force and Navy.

With modifications, a portable wire inspection technology was developed—the Voyager Intermittent Fault Detector (VIFD)—that met needs. Testing and certifications proceeded with spectacular results. The testing succeeded, with IFDIS and VIFD locating and diagnosing NFFs. The VIFD has been applied to the F/A 18, V-22, A-10, H-53, AH-64, UH-60, and Patriot Missile Systems with intermittent faults detected and isolated by VIFD in 99 percent of the wiring systems tested (or 30 different wiring systems). This technology has been formally adopted by such facilities as the Naval Surface Warfare Center, Crane Division,



A Service member repairs a military vehicle.
Department of Defense photo

with the Air Force evaluating it and the DoD assessing the benefits of utilization throughout the defense enterprise.

Shipyard Industrial Analysis. To help the four naval shipyards more efficiently maintain today's fleet, this CTMA initiative utilizes a commercial digital modeling and simulation technology modified to fulfill the Navy's needs. Using this advanced technology, already utilized by commercial shipyards, the current naval shipyard infrastructure, configuration, and maintenance processes can be evaluated to assess best practices prior to investment by creating a digital twin in order to define the optimums. This holistic approach will decrease fleet repair time, increase productivity, and save costs with the goal of enhancing Warfighter readiness now and into the future.

The Technology May Already Be Here

According to the 2019 *Department of Defense Fact Book* issued by the Office of the Assistant Secretary of Defense for Materiel Readiness, the DoD spent more than \$93 billion last year in maintenance activities, and \$163.5 billion for product support of 330,159 vehicles, 239 ships and submarines, and 14,883 aircraft. To ensure affordable readiness for such a wide array of weapon systems, the dexterity and capabilities that COTS technology can bring to bear in a range of readiness needs must be in our toolkit.

Approaching solutions in the traditional manner is a non-starter—we simply don't have enough time or resources. We have an uphill battle. But with collaboration and an eye

for what is possible, together we can achieve our readiness goals. With the speed of relevance as a new sustainment goal, the acceptance, adoption, and integration of commercially available technologies offer a cost-effective, high-impact readiness enabler.

In this environment of near-peer adversaries, constrained budgets, heavy reliance on legacy platforms, and a rapidly evolving threat environment, the DoD faces an ever-present readiness challenge. Readiness levels are a paramount concern. The DoD is committed to streamlining the traditional acquisition process to get the most technologically advanced solutions into the hands of our maintainers. Integrating COTS capabilities into the DoD's maintenance and sustainment enterprise brings the best that the U.S. industrial base has to offer to our Warfighters.

The bottom line is summarized in a prescient quote from Henry Ford: "Coming together is a beginning, staying together is progress, and working together is success."

For additional information about the CTMA Program visit www.ncms.org/ctma or contact Greg Kilchenstein at the Office of the Deputy Assistant Secretary of Defense for Materiel Readiness at gregory.j.kilchenstein.civ@mail.mil or Debra Lilu at the National Center for Manufacturing Sciences at debral@ncms.org.

The authors can be contacted at eleanors@ncms.org and bill.kobren@dau.edu.