Streamlining Maintenance for Warfighters

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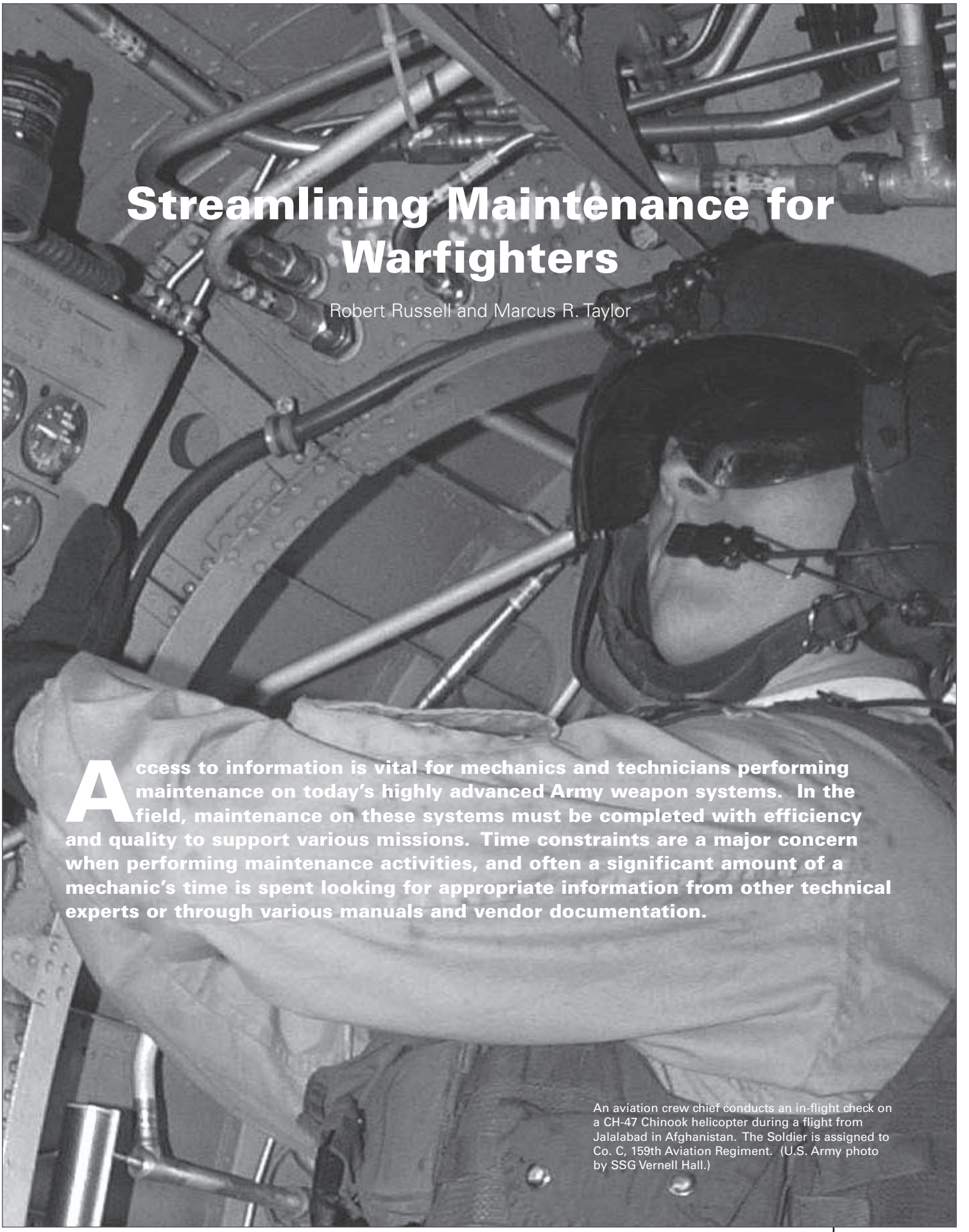


Access to information is vital for mechanics and technicians performing maintenance on today's highly advanced Army weapon systems. In the field, maintenance on these systems must be completed with efficiency and quality to support various missions. Time constraints are a major concern when performing maintenance activities, and often a significant amount of a mechanic's time is spent looking for appropriate information from other technical experts or through various manuals and vendor documentation.

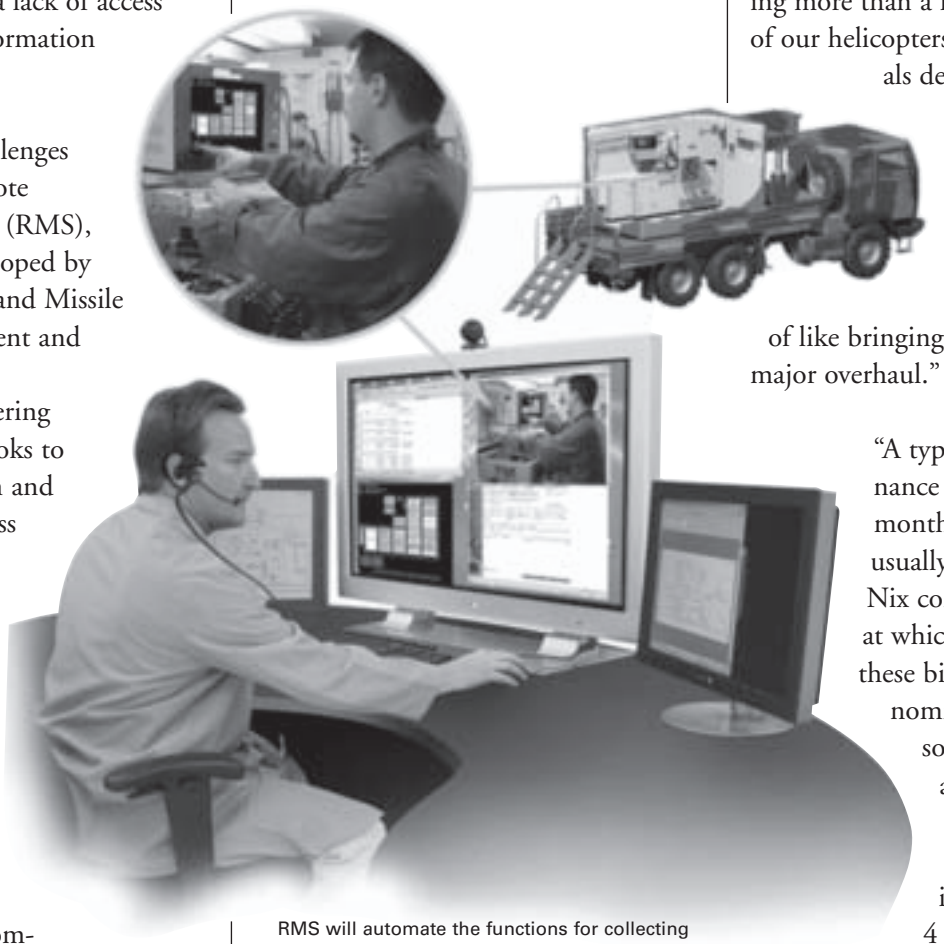
An aviation crew chief conducts an in-flight check on a CH-47 Chinook helicopter during a flight from Jalalabad in Afghanistan. The Soldier is assigned to Co. C, 159th Aviation Regiment. (U.S. Army photo by SSG Vernell Hall.)

Accordingly, reports must be read and written and information sources queried and consulted before the information can be properly filed and organized. In a wartime environment, Soldiers performing these duties are pushed to the limit to get this all done. Because this takes a considerable amount of time, it often results in inconsistent updates, ad hoc written documentation and a lack of access to old but useful information resources.

To address these challenges and others, the Remote Maintenance System (RMS), currently being developed by the Army's Aviation and Missile Research, Development and Engineering Center (AMRDEC) Engineering Support Division, looks to enhance organization and information awareness for mechanics and technicians.

Lots of air time means lots of maintenance! How do Soldiers deal with equipment problems? What do they do when they must accomplish a mission and don't have the right tools for the job? It's simple. They improvise, right? Unfortunately, improvising doesn't always correlate to doing a quality job.

The following comments are from a Soldier stationed at Camp Cooke, Iraq. "A little over 4 months ago, the helicopters of the 1st Cavalry Division's 4th Brigade Combat Team (BCT) took to the air with a vengeance," the Soldier remarked. "Flying missions that included supporting troops on the ground during combat operations, to transporting personnel between forward operating bases, the hours spent in the air quickly accumulated," he continued. "As aviation assets fly more and more missions, maintenance cycles and upkeep on the precision equipment becomes more and more crucial."



RMS will automate the functions for collecting and disseminating diagnostic information and will offer real-time human interface with SMEs anywhere around the globe. (U.S. Army photo courtesy of AMRDEC.)

Responsible for phased and unscheduled maintenance, 615th Aviation Support Battalion's mechanics are part of a 24-hour team that keeps 4th BCT's birds in the air. "Each helicopter has a number of hours it can be flown before it must be taken off-line and put into a phased maintenance cycle," explained CPT Cecil Nix, a maintenance officer with the 615th. "For the Apache, it's 250 hours, for the Black Hawk, it's 500 and for the Kiowa, 125. After they've reached that threshold, the bird is brought into the shop and my team starts phased maintenance," he continued.

"When a bird does come in, we check everything," Nix said, resting his hand on a stack of technical manuals standing more than a foot high. "Each one of our helicopters has a series of manuals detailing the exact manners and method of phased maintenance. We take everything apart, check it over, fix it if it needs it — oil, lube, etc. It's sort of like bringing your car in for a major overhaul."

"A typical phased maintenance cycle takes about a month to complete and is usually done once a year," Nix commented. "The rate at which we've been flying these birds has been astronomical. Back in garrison, we might perform a phase maintenance once a year. Here, we've been performing them about every 4 months. In fact, in June alone, 4th BCT pilots logged 1,700 hours of flight time, the highest amount for any of the commands in theater. Completing phased maintenance is very detailed work for my mechanics," Nix explained.

"An Apache coming into the hangar at Fort Hood, TX, might take 30 days to get through a maintenance cycle," Nix continued. "But realizing how important this all is, we've been getting the Apaches back on the flight line in

about 12 days. We have extremely tight quality control measures in place as well, ensuring that everything that goes back into operation has been checked, double-checked and triple-checked for safety."

"Every time one of these birds comes into our shop, we know that the safety and the trust of the pilots is in our hands. If we don't do our job, and do it right, troops on the ground don't get support and birds fall out of the sky. That's a lot of responsibility, but we all take it very seriously and we do it right," he continued. "Maintenance is a very critical job in peacetime and even more so during times of war," Nix concluded.

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Remote Maintenance System

A system that could electronically organize and automate maintenance cycle processes would be very beneficial and save the Army money and time. RMS will greatly ease the complication of working with cumbersome technical manuals and the time needed to research what phased maintenance was performed last on a piece of equipment. RMS will make this information readily available to mechanics and technicians by automating the functions for collecting and disseminating diagnostic information by organizing it electronically. Additionally, it will offer real-time live human interface with subject matter experts (SMEs) anywhere around the globe.

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RMS is a cutting-edge, breakthrough system that will greatly enhance the efficiency and cost-effectiveness of U.S. Army maintenance and weapon systems. The vision for this system is to enable weapon systems to sustain "near-zero" downtime performance through predictive and preventative maintenance. RMS' main functions will include:

- Real-time audio and video communication.
- Remote test and troubleshooting capabilities.
- Electronic distribution of software.
- Electronic distribution of maintenance aids.
- Collection of test data for prognostic/diagnostic analysis.
- 24/7 systems monitoring.

RMS is a network-based information system consisting of a software engine, data storage system, automatic test equipment (ATE), Internet, Internet protocol (IP) camera, communications headset and test program sets (TPSs). The main brains behind the system will be the maintenance computer platform that contains software to manage the RMS. This software engine will proactively "snuff out" potential maintenance problems in the various weapon systems through the maintenance TPSs used on these systems. TPSs include: TPS Kiowa Warrior, TPS Apache, TPS Avenger, TPS Multiple Launch Rocket System, TPS Dragon and TPS TOW (Tube-launched, Optically-tracked, Wire-guided).

The software engine will contain embedded computational prognostics algorithms based on the weapon system's maintenance, troubleshooting, reliability and system life-cycle profile. These prognostics algorithms will predict degradation or performance loss, and dictate a solution for preventative maintenance or self-maintenance. In addition, the system will optimize maintenance and service scheduling and synchronize logistics support for parts and spares. This information will be consolidated in a database storage warehouse at the AMRDEC Sustainment Support Center (SSC) at Redstone Arsenal, AL. Software engine features include:

- ASP/.NET Web-enabled application software.
- Diagnostic/prognostic algorithms.
- SQL database for storage.
- 128-bit secure socket layer encryption.

RMS will allow the SSC to connect remotely to virtually any ATE, TPS or maintenance computer terminal. The system is interoperable with both Microsoft® Windows and Unix-based systems. The sustainment support technician also has the capability to remotely access a client's machine to perform needed upgrades or run any type of special batch file/program. Typical nontactical applications will be connected via DOD wide area and local area networks. Portable/tactical application will connect to the SSC via satellite modem/phone Integrated Services Digital Network connections.

Soldiers at field locations will communicate in real time via headsets

and embedded IP cameras in the portable computer terminal. Two more additional micro IP cameras are located in the headset. The headset allows the technician to be able to place the camera in small, hard-to-reach areas and has an integrated laser pointer. RMS is user-friendly. Its main advantages are:

- Automatic location and retrieval of information for repairs.
- Storage of historical repair data on each weapon or piece of equipment.
- Increased efficiency of access to information from technical manuals and specifications documents from the manufacturer.
- Reduction in average time for repair.
- Remote monitoring and information dissemination.
- E-Maintenance support from SSC technical SMEs.
- Interactive real-time video and audio communication with SSC.

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There are two RMS configurations in development for fielding — a tactical/portable version to be deployed at the maintenance unit level and a nontactical version to be deployed at the depot level/RMS SSC at Redstone Arsenal. For tactical units, the system is currently slated for Military Occupational Specialty (MOS) rating 35Y — Integrated Family of Test Equipment Operator and Maintainer. Additional MOS ratings will be expanded in the future.

RMS benefits are practical and will greatly aid in automating and organizing maintenance tasks for the Army. The technology is in place and the time is right to get it into the hands of our Soldiers at war. RMS will network a plethora of maintenance and reliability information for Army equipment management and operational effectiveness. Having vital maintenance information and technical expertise when a Soldier in the field needs it greatly enhances the overall maintenance capability that directly relates to decreased downtime and reduced operating costs. Aircraft that will be likely application targets include the Apache AH-64, Kiowa Warrior OH-58, Black Hawk UH-60 and Chinook CH-47.

A beta test site for RMS evaluation and testing is being set up at Letterkenny Army Depot, PA, for CONUS operation of the nontactical version. Also, a tactical version is being sent to Afghanistan to evaluate the system's OCONUS capabilities. For more information about RMS or related subjects, contact the author at (256) 842-2705 or **Robert.Russell@rdec.redstone.army.mil**.

RMS will allow the SSC to connect remotely to virtually any ATE, TPS or maintenance computer terminal. (U.S. Army photo courtesy of AMRDEC.)

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