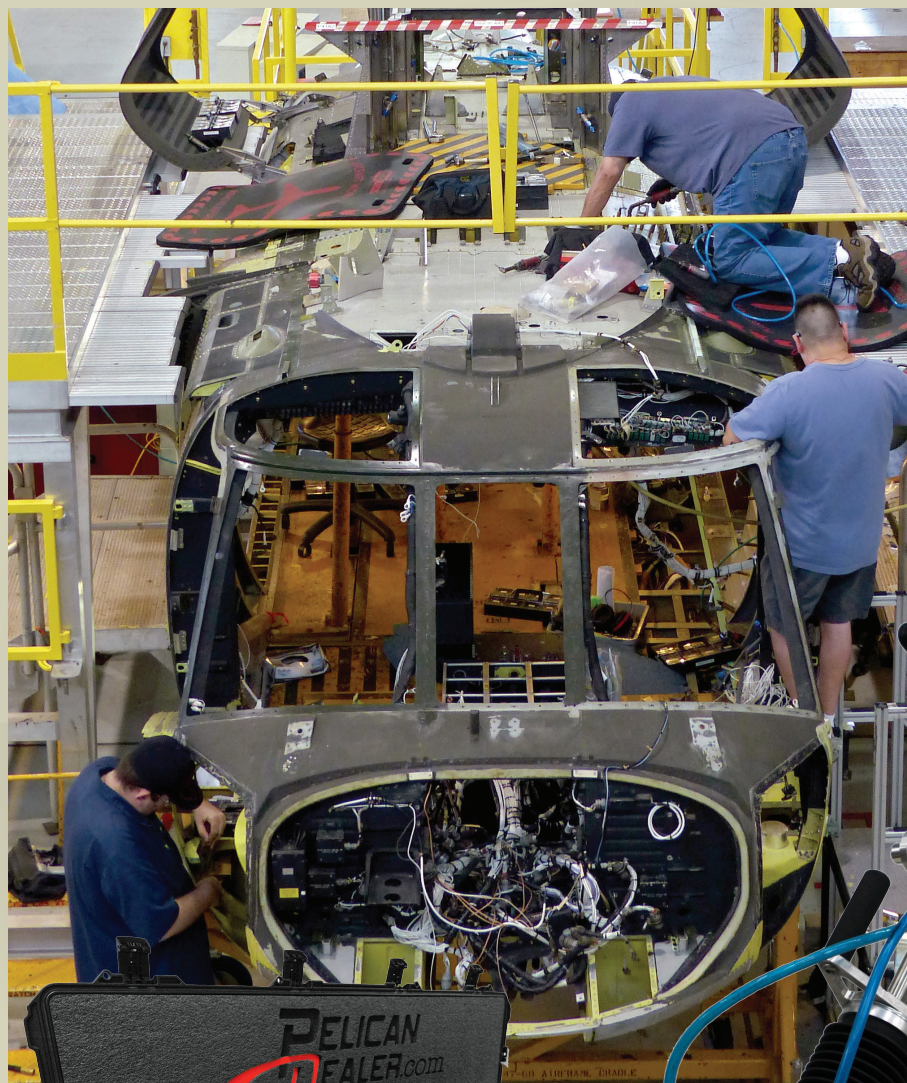


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Feature

Military Maintenance Adapts to New Realities

PAGE 4

Product Warehouse

PAGE 10

Ad Index

Advertiser.....	Page #
Advanced Torque Products	11
Gradient Lens Corporation	13
Port City Air	8-9
Pratt & Whitney Military Engines	2, 14

Military Maintenance Adapts to New Realities

The mantra “better, faster, less costly” is increasingly embedded in the way warfighters maintain their flying machines

By Jerome Greer Chandler

The traditionally conservative U.S. military may be a bit late to the party, but – beset by budget constraints – cost-conscious concepts such as condition-based maintenance (CBM) are starting to hold sway in key commands.

“Right now our efforts are focusing on CBM,” says an official of the Army Aviation and Missile Command (AMCOM) at Redstone Arsenal, Alabama. He spoke on condition that we not use his name. “We see a lot of opportunity in CBM to help reduce overall operating costs [and] improve maintainability.

“If we can maintain ... it at the appropriate time and not overmaintain it, not only are we going to get better utilization of our time, we’re not going to be spending as much time changing out parts that maybe haven’t reached the end of their service life.”

Striking the same chord is Coast Guard Commander Steve Walsh, the Medium-Range Surveillance Aircraft product line manager at the U.S. Coast Guard’s Logistics Center in Elizabeth City, NC. “We’re now working through

structural health monitoring systems to get to (CBM). Are we there yet? No.”

So far, AMCOM’s CBM+ efforts have seen some 20-plus maintenance changes wring out from 250 to 11,900 additional flight hours for components. They accomplished the feat with a none-too-shabby return on investment of from 11.91 to 1 to 18.33 to 1.

Case-in-point: by installing a sensor on the oil cooler of a UH-60 Black Hawk, closely monitoring bearing vibration levels, they were able to extend the ubiquitous helicopter’s formerly time-based five-year removal window.

A quick differentiator here between CBM and CBM+. AMCOM says, “In a CBM environment, operating platforms, embedded sensors, inspections, and other triggering events determine when restorative maintenance tasks are required based on evidence of need.”

Contrast that with CBM+, which AMCOM defines as “a proactive equipment maintenance capability enabled by using indications to predict functional failure ahead of time and take appropriate action.” The implications

aren’t trivial. The Army contends CBM+ “marks an evolution from the earliest applications of embedded health management.”

Back to that Black Hawk oil cooler, the *further* implications of this brand of CBM, contends an AMCOM official, “highlights the fact ... you can actually look at the health of the drive train of a system, vs. just an individual component.”

Cut from the same cost-cutting cloth as condition-based maintenance are U.S. Air Force’s efforts at what it calls “cost-effective readiness.” Spokesman Micah Garbarino says once upon a time the Air Force would replace, rather than repair, certain fan blades on some engine components. After studying the issue it determined “that a percentage could be fixed instead of discarded; so we focused on recovery and repair.” The upshot: by using certified reconditioned blades the Air Force Life Cycle Management Center avoided some \$80 million in additional costs.

For all this CBMization that’s occurring in the U.S. military maintenance, the innate caution of the services

UH-60 Black Hawk helicopters at Lowe Army Airfield, Fort Rucker, Alabama.

U.S. ARMY





hasn't gone away. "We wouldn't jump into anything maintenance-wise that could jeopardize our aircrew," says the Coast Guard's Walsh. "That's clear ... We'll accept a little higher cost to assure that folks are safe while out in harm's way."

QUICKER RETURNS TO SERVICE AND ADDITIVE MANUFACTURING

The mantra "better, faster, less costly" is increasingly embedded in the way warfighters maintain their flying machines. Take the instance of an AV-8B Harrier aboard *USS Bataan*. After takeoff, the pilot couldn't deploy the nose gear. Rigging a support cradle on the flight deck of the carrier the aviator was able to bring his VTOL (vertical takeoff and landing) Harrier to a hard, but controlled, landing.

But the airframe paid a price. "The hard landing had damaged a portion of the structural frames in the nose

cone," says Rich Bomhold, technical director of the U.S. Navy's Fleet Readiness Centers. The OEM, working with a structural engineering analysis from the Fleet Support Team (FST), fashioned a 3-D CAD model of the offending frame.

Because only a portion of the frame was damaged, officials decided to cut out just that section and replace it with a matching section cut from a spare frame at Fleet Readiness Center East (FRCE). Sheet metal doublers would mate the new section of the frame with the aircraft. The strategy would eliminate the need to further dismantle the nose cone.

"The challenge for FRCE," says Bomhold, "was to manufacture the reinforcement doublers and get them to the ship for the repair."

Within 48 hours of getting the OEM's CAD model FRCE's additive manufacturing was underway. One forming tool took five hours to build;

the other about 30. Computer-aided design and additive manufacturing meant one-week turnaround from the OEM model to finished part. The larger picture saw the AV8-B damaged June 7, 2014 and the newly formed part was on its way to *USS Bataan* July 2.

BUDGET BLUES

This sort of fast turn is going to be increasingly important. "Repair, maintenance, and overhaul budgets are expected to be reduced over the coming years – while demand for aircraft, engines, and components will increase," says the Fleet Readiness Centers' technical director. "Additive manufacturing promises to be an innovative ... technology that can change aircraft maintenance business models in the future."

It's going to take a lot of innovative technologies and new approaches to help the U.S. military manage its maintenance needs for the rest of

CH-47F in phase maintenance at Fort Rucker, Alabama's Hanchey Army Airfield.

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CBM+ technology has also been instrumental in reducing, and in several cases eliminating, time-consuming manual inspections and vibration checks. Automation of these tasks, along with the ability to bypass replacement of components until later maintenance phase periods, has empowered the U.S. Army helicopter maintainers to focus on other tasks that support readiness.

this decade and the next. Air Force Sustainment Center spokesman Micah Garbarino says, "Without a doubt, the biggest single challenge to Air Force maintenance is our budget constraints and uncertainty." He says the USAF has still not fully recovered from the impact of 2013 sequestration, "and we are looking at a return to those same drastic cuts in fiscal 2016."

To that end, not only is the Air Force bringing new technology to bear, Garbarino says, but "We have focused on removing barriers to communication that existed when there was separate management at each [overhaul] depot." That's allowed them to "standardize and improve processes and partnerships, both public and private."

Those public/private partnerships encompass civilian third-party providers. In the Army the percentage of third-party contract maintenance depends on location. The AMCOM official at Redstone Arsenal says because the United States is limited as to the number of military personnel

it can field in Afghanistan, there are a higher number of civilian maintainers overseas, in theater. Stateside, the percentage is lower, "something in the neighborhood of 15 percent," he says.

Here in the United States, that means contract labor tends to maintain complex systems: electrical, armament, and such. A significant slice of composite repair also is outsourced.

More than budgetary considerations and specialized skills are driving outsourcing. So too is the readily available pool of seasoned military maintainers. "It takes us anywhere from five to seven years to take an individual that graduated from TRADOC (Training and Doctrine Command) and mold them into journeymen," says an Army Aviation and Missile Command official. Some are lost to the civilian world, others elevated to supervisory positions within the military. The military is past master in rewarding good performance with promotion. The upshot: "They're taken away from the aircraft in between that time that we grow the

journeyman [into] the artisan," says an AMCOM official.

Confronted by the realities that beset aviation maintenance as a whole, the U.S. military is learning to adapt. And it's doing so fast. ■



JEROME GREER
Chandler is a two-time winner in the Aerospace Journalist of the Year competition's Best Maintenance Submission category; he won in 2000 and 2008. His

best-seller 'Fire and Rain' chronicles the wind shear crash of Delta Flight 191 at DFW. Chandler's passion for aviation safety is more than professional. It's personal. Two of his relatives have perished on commercial airliners, one of them in the infamous Braniff Electra crash of 1959.

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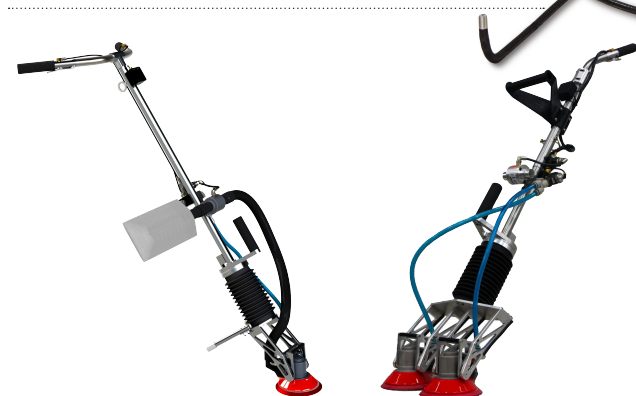
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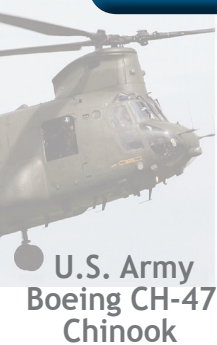
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