

# A DIGITAL AIRCRAFT AND ITS IMPACT ON THE SUSTAINMENT ENTERPRISE

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## INTRODUCTION

The arrival of the CH-53K is coming after more than a decade of digital maintenance experiences for the military. It is also coming after the supply chain shortfalls evidenced by the pandemic and the Western effort to supply the Ukrainian forces.

And finally, it is coming when the U.S. military is working a strategic shift to distributed operations with all of the challenges associated with doing so logistically.



A U.S. Marine Corps CH-53E Super Stallion helicopter and a CH-53K King Stallion helicopter, assigned to Marine Aviation Weapons and Tactics Squadron One, descend in an assault raid exercise during Assault Support Tactics 2 (AST-2), part of Weapons and Tactics Instructors (WTI) course 1-24, at Yuma Training Range Complex, Arizona, Oct. 18, 2023.

This confluence of developments is the context within which the CH-53K is coming into the force.

I talked in September and October 2023 with Pierre Garant, a former Marine, and now at Sikorsky about how he saw this challenge and opportunity. We focused on how leveraging a digital aircraft could profoundly change the sustainment enterprise.

This report includes the three interviews we did.

ONE  
DIGITAL MAINTENANCE IN THE SHIFT  
TO DISTRIBUTED MARITIME  
OPERATIONS

The U.S. Navy and USMC are working closely together in shaping their approach to distributed operations. The Navy refers to distributed maritime operations; the Marines to expeditionary basing operations. Working closely together they are focused on weaving these approaches together to shape a more lethal and survivable approach.

What can be missed in this strategic shift is the challenge posed for logistics and support of such a concept of operations. For the Marines, part of the challenge is to ensure that the force deployed on their expeditionary or amphibious fleet is fully operational with high state of readiness and sustainability.

Part of the answer of how to do this can be found in what effective digital maintenance can deliver. The Marines latest air system to go onboard the expeditionary or amphibious fleet is the CH-53K. This new air asset is coming to the force after more than a decade of Marine Corps experience with digital maintenance experience in such systems as the F-35.

In other words, the CH-53K is coming to the fleet as the military and commercial aircraft users have more than a decade now of experiencing the benefits, opportunities and challenges of working with digital systems and predictive maintenance. The CH-53K will bring its own capabilities to this change to maintainability.

And connecting such capabilities to the needs of a distributed force is a key part shaping a way ahead for the Marine Corps. If one has more accurate data and predictive performance data then the ability to anticipate what parts need to be where can help to ensure the highest readiness rates possible for the CH-53K.



U.S. Marines with Marine Aviation Weapons and Tactics Squadron One, conduct maintenance on a CH-53K King Stallion helicopter during Weapons and Tactics Instructor (WTI) course 1-24 at Marine Corps Air Station Yuma, Arizona, Sept. 29, 2023. WTI is an advanced, graduate-level course for selected pilots and enlisted aircrew providing standardized advanced tactical training and assists in developing and employing aviation weapons and tactics. (U.S. Marine Corps photo by Lance Cpl. Emily Hazelbaker)

Recently, I talked with Pierre Garant, a former Marine with many years of logistics and sustainment experience who now works at Sikorsky on the CH-53 program, about the CH-53K and digital maintenance. What we initially

focused on was that having a maintenance system based on digital systems generated data which allows you to do fleet management.

As he noted: “With the S-92, Sikorsky manages a fleet with close interaction with its customers. We manage aircraft tail numbers with serial numbered items and predict the behavior of the component airframes and then can anticipate the need at the node wherever that is in the world.

“This works if the company and the customer shape a common culture able to leverage the data; and this is crucial as well with the military customer.”

The DoD customer now has more than a decade of experience with digital maintenance systems but has to continue its journey to fully work with industry to replicate what commercial customers have experienced in terms of the increased availability of aircraft by leveraging digital maintenance systems.

As Garant noted: “It is as much about process as about technology. It is about sharing data in a collaborative workspace to achieve the common objective to have higher readiness rates at less cost. We have focused on having collaborative data sharing in our analytics workspace in order to position the CH-53K for progress in this area.”

We then turned to the question of how this capability intersects with what the regional combatant commander needs and wants.

Garant underscored: “With the S-92 center at Sikorsky has managed data that is regionally specific. We can do the same for the CH-53K. We can build a data base that provides predictive maintenance data for the various regions that the Marines will operate the aircraft.

“Regional combatant commanders want more certainty

with which systems will be available for which operations and in what time frame. The purpose of having a much more effective predictive maintenance regime is not an in itself activity; it is directly tied to the need of the combatant commanders.”



TWO

THE CH-53K IN THE NEW STRATEGIC  
ERA: THE CASE OF THE  
SUSTAINMENT ENTERPRISE

The USMC has introduced three major air platforms in the past twenty years. The Osprey was introduced during the land wars, but introduced during the Obama Administration's "pivot to the Pacific."

But with the Trump Administration's emphasis on the "great power competition" in 2018 it began its enhanced role in the Pacific which has seen the introduction of the CMV-22B.

I have written about that in my book *The Role of the Osprey in the Pivot to the Pacific*.

Next the USMC introduced the F-35B and it played a key role in the ability of the U.S. military with partners to build out fifth generation capability during the era of the land wars. But not until the "great power competition" shift did the U.S. really focus once again on the fifth-generation transition.

Indeed, in my view this only is beginning again and the focus on how to effectively integrate and support a global fleet of U.S. and allied F-35s (what I call F-35 2.0) is only underway now.

I wrote about this in my book *My Fifth-Generation Journey: 2004-2018*.

But the CH-53K is being introduced in the new strategic context, in the era of “great power competition” and peer conflict. Hence, it is being introduced when its capabilities including its digital backbone need to be considered from the standpoint of the strategic context within which it is being introduced.

It is also being introduced in a context where there have been two strategic events which have also underscored that the logistical and sustainment approach used during the land wars is simply irrelevant. The pandemic undercut civilian and military supply chains and underscored their fragility.

The conflict with China has also underscored the importance of secure supply chains rather than just-in time delivery from global suppliers wherever they are located and whatever their politics.

The war in Ukraine should not have been a shock and was logically implied in earlier Russian actions. We wrote about this in our book, *The Obama Administration Confronts Global Change*.

But what this war has overwhelmingly demonstrated is the lack of depth in the supplies to support military operations.

Not only has just-in time delivery and the absence of investment in supplies and equipment stockpiles been shown to have failed, the investments in building supply depth have still to be made in a coherent or strategic manner.

Enter the CH-53K. Here is an aircraft whose digital backbone can be leveraged to build predictive maintenance and an ability to shape effective knowledge of the supplies

needed at the tactical edge to ensure that the CH-53Ks onboard the Navy ships it is supporting in distributed maritime operations can have the operational levels needed.



U.S. Marines with Marine Aviation Weapons and Tactics Squadron One, conduct maintenance on a CH-53K King Stallion helicopter during Weapons and Tactics Instructor (WTI) course 1-24 at Marine Corps Air Station Yuma, Arizona, Sept. 29, 2023. (U.S. Marine Corps photo by Lance Cpl. Emily Hazelbaker)

But how to ensure that the government, the prime contractor and the supply chain can do this?

To date, the best way to do that has been through a system called performance-based logistics. This is a system in which the government and the contractor work a partnership to incentivize the contractor to deliver best value supply chain support to the government.

It has been based largely on the model of the land-wars

in terms of operating at a pace necessary for peacetime deployments or support for warehouses abroad to support land operations.

It has not been re-shaped to do what the Israelis have thought necessary with their CH-53Ks, namely an ability to surge to support in time of conflict. Or put another way, if peacetime ops are not the norm, but surge operations to various levels is, how do we reshape PBLs to meet the new strategic norm?

I continued my conversation with Pierre Garrant concerning the CH-53K and sustainability along these lines.

According to Garrant: “The purpose of a PBL is to incentivize long-term production of the supplies for the aircraft. It allows the company working with the government on a PBL to build effective longer-term relationships with suppliers to have money flowing to ensure production of every key element needed to supply the operational fleet of aircraft.

He argued that “you’re building resiliency, and you’re building to anticipate obsolescence issues and to get ahead of the game with regard to problems and challenges to ensure supply chain effectiveness. Given the key role as well of government depots they are key partners in this entire effort.

“As we talked about last time, with the data coming off of the aircraft, we can generate big data to shape a realistic assessment ongoing of the performance of parts which can could then be used and translated in better management of the supply chain and to do so to get at those surge issues you mentioned.”

In my view, the traditional PBL approach has largely been an accounting approach to improve efficiency in the

use of supply dollars. In a new PBL approach, the need to surge would be part of the consideration in funding the PBL.

The legacy PBL has laid a solid foundation but we cannot assume that peacetime ops is the norm to define a PBL; we need to build in surge considerations in an era of great competition.

THREE  
LEVERAGING A DIGITAL AIRCRAFT  
TO SHAPE A SUSTAINMENT  
ENTERPRISE EXTENDING TO THE  
TACTICAL EDGE

I have focused in a series of interviews with Pierre Garant on how to leverage a new digital aircraft, the CH-53K, to shape an innovative new approach to sustainment.

Clearly, technology is not enough. Organizational change enabled by technology is required and to do so in terms of new partnerships among industry, the government and the service operating the aircraft.

In this interview, I discussed the way ahead with Pierre drawing on his knowledge gained during his extensive career having worked logistics and sustainment from his unique perspective gained by working in the USMC, the government and industry. I was discussing the approach with Garant in a role of a future DOD sustainment planner and operator.

In that perspective, I sketched out what could be the future of end-to-end sustainment built around the inherent capabilities of a new digital aircraft.

The way I look at it, the digital backbone on the CH-53K has enabled the digital twin to drive the design and evolution process. As experience is gained from the use of

the aircraft and data flows back to the digital twin, this will allow for configuration control and adaptation.

In addition, with the rapid arrival of advancing technologies, such as 3-D printing, which the Marines are clearly working with, distributed operations can be combined with digital manufacturing driven by the digital twin as well.

This means that the digital backbone on the aircraft allows not only for predictive maintenance and the organizational possibility of greater accuracy in having parts moved closer to areas of the operating force of the particular aircraft, but that 3-D printing can allow for the capability to provide for enhanced sustainability in the field and in the areas of operation.



A U.S. Marine Corps CH-53K King Stallion helicopter, assigned to Marine Aviation Weapons and Tactics Squadron One, executes an external lift of a High Mobility Multipurpose Wheeled Vehicle during Weapons and Tactics Instructor (U.S. Marine Corps photo by Lance Cpl. Elizabeth Gallagher)

Garant highlighted the need to get beyond legacy thinking about sustainment to achieve such an approach.

“Condition-based maintenance opens a significant opportunity to move beyond legacy approaches to logistical support. We need to shape a forward leaning approach

rather than taking the new aircraft and fitting into a legacy box for how we have done logistical support in the past.

“We need to go beyond how the digital twin and the digital process allows us to build the aircraft differently to how we can recraft the sustainment enterprise to support the warfighter and their needs at the tactical edge.

“It is about making the warfighter in combat having greater readiness of aircraft at the point of operation, not just using the old approach of moving parts to inventory positions and then out to the field. It is early days for 3D printing, but the Marines are moving out in this area.

“I think your emphasis on linking the entire digital change from production and the digital twin to the use of digital or additive manufacturing in the field, which what 3D printing provides, is part of a crucial shift in sustainment management or the sustainment enterprise.”

I argued that working the relationship between how predictive maintenance could allow surge support by moving supplies closer to the warfighter based on anticipated use needs and determining what 3D printing could supply at the key point of need is a work in progress. And as the user community determines which method – build and deliver or build at the point of operation is best – the desired mix could be shaped.

The point is that the needs of the warfighter at the tactical edge can drive through the digital chain how the sustainment structure functions, and not the legacy approach of sequential decisions by authorities at each stage of a highly bureaucratized process of hand-offs in the logistics chain.

Garant underscored that when actual production of an aircraft ends, it is all about sustainment and having parts to support operations. We need a new approach to the sustain-



ment enterprise which the technology of a digital aircraft unlocks.

In my view, it is never just about technology. After all, we had radar at Pearl Harbor, and we know how that turned out.

