



The Tip of the Spear for
the USMC: The Role of
MAWTS-1



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How MAWTS-1 Supports Change in the USMC

By Robbin Laird

During my latest visit to MAWTS-1, I had a chance to focus upon recent developments generated by the latest WTI course.

Last year, I had a chance to talk with Col Wellons and LtCol Ryan Schiller, the Aviation Development, Tactics and Evaluation Department Head, about work on F-35 integration with HIMARS.

This time I had the chance to meet LtCol Schiller in person and talk with his team about both the Tactical Demonstrations (TACDEMOS) and Tactics, Techniques and Procedures (TTP) Development initiatives that they worked on during the latest WTI exercise.

The attendees also included LtCol Waldron, Maj Watts, Maj Zasadny, Maj Buxton, and Capt Jacobellis.

With regard to TACDEMOS, among the key efforts were the use of the Light-Marine Air Defense Integrated System (L-MADIS) for force protection/defense, the use of the new Gorgon Stare ISR system, improvements such as using new noise cancelling helmet microphones and new technologies for JTAC cueing, etc.

With regard to TTPs Development, a number of initiatives were conducted which allow the Marines to operate with more lethality and survivability in a variety of combat settings.

These TTPs included working with a new precision penetrator warhead on the laser guided APKWS rocket, F-35 distributed STOVL operations, F-35 and HIMARS integration as well as various aspects of MAGTF digital interoperability such as operations in a contested environment.

MAWTS-1 is working with industry and various USMC and USN organizations to test out new technologies as well as new TTPs to support the strategic shift from a focus on counter-insurgency operations to contested near-peer force-on-force engagements.

It was a very wide ranging conversation and I am going to simply highlight a few elements from that conversation to give insight into their methods as well as the strategic shift underway.

According to LtCol Schiller, a key function of ADT&E is to assist in the process of informing future requirements.

“It is part of our mission to help requirement officers in Headquarters Marine Corps.

“We do this by taking items from DARPA, research labs, industry and the PMAs and integrate them into WTI courses.

“We then provide an after action report with our assessment on their performance and utility to the force.”

The students and instructors in the course help provide a realistic performance assessment for new equipment or technologies in an effort to help the USMC fill current and future warfighter gaps.

A particularly interesting TACDEMO was JTAC Virtual Cueing.

In effect, this piece of equipment is part of the shift to enable increased situational awareness to the JTAC.

It also has the potential to improve training.

JTAC Virtual Cueing permits simulated threat environments, close air support aircraft and weapons in an objective area that can measurably increase training and proficiency of JTACs while significantly reducing costs to the taxpayer.

However, solely focusing on the GCE may result in missing some of the less visible aspects of what is going on at MAWTS-1.

Through a variety of developments, the Marines are focusing on extending the range of offensive and defensive capabilities in the battlespace from the air and sea to support the GCE ashore.

While the Marine Air Ground Task Force (MAGTF) tends to operate as its own entity, these new technologies will permit synergistic lines of effort with joint or even allied ground, air and naval elements.

One example of this being tested at MAWTS-1 is the continued integration of Ground/Air Task Oriented Radar (G/ATOR) TACDEMOS.

G/ATOR provides targeting information and fires support ashore.

One challenge will be to shape a MAGTF, joint and allied understanding of how to efficiently operate in concert.

This is magnified with the introduction of the F-35 which provides significant MAGTF organic support but also possesses capabilities to enable joint and allied fourth generation aircraft as well.

A key focus was how to manage and conduct Integrated Fire Control between G/ATOR and F-35.

“We focused on how to maximize three core systems – G/ATOR, the Composite Tracking Network (CTN) and CAC2S (the latest software iteration of the Common Aviation Command and Control System) as they are fielded to the force for the first time as a systemic whole.”

“We are going to be able to provide significantly greater information to all of the shooters, whether airborne, shipborne or ground based missile defense systems.”

A key challenge for the ADT&E Department at MAWTS-1 is to change the mindset of Marines in order to get them to understand and adopt new TTPs for new systems and not simply adopt a less effective legacy mindset.

In addition to TACDEMOS, the ADT&E Department continuously refines TTPs for the Fleet.

One TTP initiative conducted during the WTI course was Distributed STOVL operations (DSO) with the F-35, which is clearly a work in progress.

During the previous WTI they conducted DOS with MV-22 support, but during this course they did use a KC-130J.

“The KC-130J took off with Marines, ordnance, fuel and a security team.

“They landed at a remote facility, set up two forward arming and refueling points as well as a defensive perimeter.

“Shortly thereafter, two F-35s landed and received hot fuel and hot-loaded ordnance, then they took off and executed their mission.

“We are clearly working towards and expeditionary air base type of mindset for the force.”

They also integrated TTPs for both Group 4 and Group 1 UASs, both in an offensive capability as well as in a layered defense from threat UASs.

Finally, we discussed digital interoperability and its role in the evolution of the MAGTF.

And I had a chance to see and work with the MAGTAB.

This is a commercial tablet with an encrypted link to provide a means for the MAGTF to handle the transfer of relevant data throughout the Aviation Combat Element and Ground Combat Element (GCE).

The Marines have taken an off-the-shelf commercial technology and adapted it to provide core data communications capability within the USMC, and as one Marine put it, “have shown others in the joint force that you don’t have to write a complicated requirements document to get a cutting edge capability.

“This represents significant progress in terms of understanding how we can leverage commercial technology in the current fight while still meeting requirements to have low risk in terms of data protection and transmission security.”

During this WTI course, the ADT&E Department placed significant focus on creating a disrupted battlespace which included jamming, electronic warfare and other key non-kinetic elements.

Several members of the joint community also participated at WTI bringing advanced capabilities to play in the tron warfare area.

The goal is to get Marines to proactively think about how the adversary will conduct battle so that strengths can be countered and weaknesses exploited.

It is also becoming more and more important to prepare Marines to incorporate the use of non-lethal disruptive technologies and techniques.

One of the MAWTS officers highlighted the fact that when Harriers drop bombs, the pilots and GCE can see the immediate effect.

But when they fly jamming pods, they do not see the immediate effect and can be frustrated.

“But their jamming effect could be much more significant than the bombs that they might have dropped in conflict.”

Learning how to engage in such a manner is part of the technology-training challenge as well.

The featured photo shows an AN/TPS-80 Ground/Air Task Oriented Radar starting up at Marine Corps Air Station Cherry Point, N.C., Feb. 26.

The AN/TPS-80 will replace the AN/TPS-63 and reduces set up time from eight hours to 30 minutes for the system.

Marine Air Control Squadron 2 received the first G/ATOR issued to the Fleet Marine Force following testing to improve the squadron's readiness and expeditionary capabilities.

CHERRY POINT, NC, UNITED STATES

02.26.2018

Photo by Lance Cpl. Ethan Pumphret

2nd Marine Aircraft Wing

The slideshow highlights WTI and STOVL distributed training and the photos are credited to the USMC.

In a story written by Monique Randolph and published by Marine Corps Systems Command on March 13, 2018, the the G/ATOR system was highlighted:

For the Marine Corps' Ground/Air Task Oriented Radar program office, reaching initial operating capability is a big deal—a momentous occasion, in fact. The one-of-a-kind radar system is more than 10 years in the making, but will help the Corps outpace emerging threats for decades to come.

“Most people, even in the acquisition field, don't understand how long it takes to deliver a radar [to the fleet]—it's a complex system, and the services only build them every 30 to 40 years,” said John Karlovich, program manager for GATOR/Ground-based Air Defense within Program Executive Officer Land Systems.

Unlike some other weapon systems, a radar is not something the military can buy commercially. They must be designed and customized to meet the precise needs of the service.

“We pretty much start with a clean sheet of paper and go from how to develop it, through development, to fielding and then sustainment,” he said. “The bulk of the 10-plus years to get to fielding was engineering and test centric, but the last year and a half and through the life of the system is sustainment and life-cycle support centric.”

For G/ATOR, that life cycle will be 30 years or more.

“A program—regardless of size or complexity—goes through the same steps, but there are transition points; we're in a transition point,” said Maj. James Thompson, military deputy for operations in the G/ATOR program office. “Once the system is fielded, you have to focus on spares, life-cycle sustainment, and operational assessment—meaning once you put the system in the hands of Marines, how are they going to use it? So now that we've fielded G/ATOR, we'll go through continued observation and user feedback, but at the same time, we have to sustain the systems we're putting out there.”

The program office works with Marine Corps Logistics Command, Global Combat Support System-Marine Corps, and Marine Corps Systems Command's supply entities to coordinate sustainment and logistics requirements.

The road to IOC was long, but it was worth the wait because Marines are now getting a system that will reap benefits for many years, Karlovich said.

G/ATOR is a next-generation sensor that works in concert with the Corps' existing Common Aviation Command and Control System, or CAC2S, and the Composite Tracking Network to provide connectivity with joint forces as well as across the Marine Air-Ground Task Force.

It replaces five legacy systems (two of which have been retired) with a single solution, and is the first air-cooled, active-array radar of its kind in the Department of Defense.

G/ATOR is lightweight, rugged and can be towed by the Medium Tactical Vehicle Replacement, and provides increased range and accuracy over the legacy systems.

An application-based software system allows G/ATOR to support both air and ground-based operations.

"This team took [G/ATOR] from concept to fielding—we delivered the most capable expeditionary ground radar of its kind," Karlovich said. "It's a quantum leap forward compared to existing radars, and does exactly what it's supposed to do in terms of providing dominant, peer/near-peer capabilities to the warfighter."

Two aviation units—Marine Air Control Squadron 1 in Yuma, Arizona, and MACS 2 in Cherry Point, N.C.—received their G/ATORs last month. They will put the systems through their paces during the Weapons and Tactics Instructor Course 2-18 exercise in Yuma in April.

"I think we'll get a lot of feedback from the Marines involved in that exercise because they can use [G/ATOR] the way they want to, rather than from a scripted test perspective," said Thompson. "They will use this system in ways we never thought possible."

As part of the operational testing phase, members of the G/ATOR team will travel to Yuma to observe the Marines using the radar, and collect data about any issues or problems they encounter. The exercise will also give the team an opportunity to gather feedback from the broader aviation community.

"WTI 2-18 involves the entire Air Combat Element, so they will all be paying attention to what this system can do and what [the Marines] are capable of doing now," Thompson said.

In all, the Corps will field 45 G/ATOR systems Marine Corps-wide by 2024. The next unit to receive it will be the 11th Marine Regiment at Camp Pendleton, California.

"We're not about having fair fights; we're about fielding a dominant capability," Karlovich said. "After undergoing a major reorganization and reset to the program in 2010, we've maintained constant schedule and performance requirements ever since. A lot of hard work was done by a lot of folks well before I got here to get us to this point. I'm very proud of this team."

Col. Wellons, MAWTS-1: Shaping a Way Ahead for the USMC and the Joint Force

By Robbin Laird

MAWTS-1 plays a unique role within the USMC and in the joint force.

In our book on the reshaping of Pacific strategy and the role of new technologies and concepts of operations, we highlighted the role of the warfighting centers in the development and evolution of US forces, for which MAWTS-1 has played a key role with the Marines first introducing Ospreys and then F-35s into the warfighting force.

MAWTS pilots and trainers are looking at the impact of V-22 and F-35 on the changes in tactics and training generated by the new aircraft. MAWTS is taking a much older curriculum and adjusting it to the realities of the impact of the V-22 and the anticipated impacts of the F-35.

MAWTS is highly interactive with the various centers of excellence in shaping F-35 transition such as Nellis AFB, Eglin AFB, the Navy/ Marine test community at Pax River, Maryland, and with the United Kingdom.

In fact, the advantage of having a common fleet will be to provide for significant advances in cross-service training and CONOPS evolutions.

Additionally, the fact that MAWTS is studying the way the USAF trains combat pilots to be effective flying the F-22 in shaping the Marine F-35B Training and Readiness Manual is a testimony to a joint-service approach.

This is all extremely important in how MAWTS is addressing the future.

An emerging approach may well be to take functions and then to redesign the curriculum around those functions.

What we forecast in our book is certainly happening.

During my recent visit to Yuma Marine Corps Air Station in May 2018, I had a chance to discuss the recent experience of Marines shaping and participating in the latest warfighting exercise or WTI Course.

The course is a seven-week training event hosted by the squadron's cadre. The squadron provides standardized tactical training and certification of unit instructor qualifications to support Marine aviation training and readiness and assists in developing and employing aviation weapons and tactics.

The role of the WTI was described in an article by Sgt. Sarah Fiocco and published on April 21, 2015 as follows:

In a seven-week period, the cost of sending one Marine through Weapons and Tactics Instructors course is comparable to the cost of a four-year education at an Ivy League university.

Sponsored by Marine Aviation Weapons and Tactics Squadron 1, the cost to graduate one certified weapons and tactics instructor from the course is \$200,000. A cost, which puts each candidate through a full range of advanced aviation operations.

The course serves to train the best pilots in the Marine Corps to return to their units as training experts. This process requires countless hours from the MAWTS-1 instructors and staff to ensure they are sending exceptionally-trained WTIs back to the fleet Marine force.

"These students will be the people, who the commanding officer looks to when it comes to handling the training plan of an entire squadron," said the Academic Department Head, WTI, MAWTS-1. "He looks at them to be the guy, who says, 'We're good to go to combat.'

"He's the guy the CO will trust."

Before pilots can even attend the advanced course, they must fulfill a slew of prerequisite certifications, to include low-altitude tactics instructor and air combat tactics instructor. Pilots achieve most of these certifications from their units, building their experience base in order to qualify them for the WTI course.

“These pilots are already instructors before they come out here,” the Academic Department Head said. “We also go see these Marines fly three to six times a year before they come to WTI.

“We can say, based off our experience, if a Marine we observed is ready to go to WTI, or if they need to work on something.”

On the first day of class, the pilots receive a 50-question inventory test. This is followed by nearly two months of classroom instruction, flight simulators and piloting training flights on their specific aircraft.

The course begins with instruction exclusive to each student’s aircraft then expands to advance training that incorporates other platforms and units.

The students will graduate as experts on their particular aircraft, with the knowledge of how to plan and how to train others. These skills acquired from the course will ultimately be applied to their fleet units and Marine Corps operations as part of the Marine Air Ground Task Force.

“During the final exercise, everyone is working together. From close air support, to battalion lifts, the whole MAGTF is involved,” the Academic Department Head said. “When we get to that final exercise in WTI, it’s all on the students. They know how to put together a plan and execute, so we are sitting back for the most part just being safety backstops.”

Much like the selection process for the students, the staff is selected for the high-level of expertise they bring to course. WTI instructors’ contribution to training and standardization of coursework is what makes WTI the valuable asset it is to the Marine Corps.

“All the instructors, who teach here are handpicked,” the Academic Department Head said. “We do everything we can to ensure the fleet is getting back the best instructors possible.”

The Weapons and Tactics Instructor Course is a seven-week course consisting of advanced tactical aviation training designed to produce weapons and tactics instructors.

The course will serve in key training officer billets to act as a training expert in the fleet, ensuring that Marine aviation units continue to train effectively and to a standard across the Marine Corps. It is courses like WTI, which reinforce the Marine Corps’ role as our nation’s force in readiness.

WTI has become especially significant as the Marines are going through the strategic shift from a predominant counter-insurgency and stability operations period of warfare to preparing for higher-intensity, peer-to-peer conflict.

It means as well that crisis management in a counter-insurgency operations is clearly different from those involving higher levels of conflict and potentially including peer competitors.

And as the Marines have already introduced the F-35 into the MAGTF and are adding the CH-53K and other new capabilities, there is a clearly a shaping and learning process underway for the USMC and the joint force.

MAWTS-1 is clearly at the center of this process.

During this visit, I had a chance to talk with the outgoing CO of MAWTS, Col. Jim Wellons about his time at MAWTS.

We have talked before during his time at MAWTS and those interviews as well as follow-ons can be read here:

<https://sldinfo.com/2016/12/the-way-ahead-for-usmc-con-ops-the-perspective-of-col-wellons-co-of-mawts-1/>

<https://sldinfo.com/2017/11/evolving-the-capabilities-of-the-magtf-the-case-study-of-the-f-35-and-himars/>

<https://sldinfo.com/2017/11/an-overview-on-wti-1-18/>

With the coming of the F-35, the Marines have led the way at the outset for the US services which has meant that the Marines have been working closely with the USAF as that service brings its F-35s into initial operating capabilities.

According to Col. Wellons: “We have always had a close relationship with the US Navy.

“We are after all Naval aviators.

“I cannot over-emphasize our close working relationship with the US Navy and Top Gun, where we have always had several USMC aviators filling highly sought after exchange tours.

“We have some challenges but also many opportunities.

“Top Gun has a strong emphasis on Super Hornet and are just beginning to roll out their F-35C course, which we intend to support.

“We have legacy F/A-18s but do not fly the Super Hornet and the USMC has been leaning forward on the establishment of the full spectrum of F-35 tactics, having already executed five WTI classes with the F-35B.

“Recently we have made huge strides in establishing ASLA joint communications standards and we are closer now than ever before to aligning all the service standards with joint communications – all the service weapons schools have been cooperating in this effort.

“With regard to working with the USAF — over the past decade, as we operated together during the wars in Iraq and Afghanistan, we became much closer and better integrated across the service weapons schools.

“But the advent of the F-35 has really accelerated our close working relationship with the USAF.

“The standup of F-35 was “joint” from the very beginning, and the USMC has been aggressive with the stand up of our operational F-35s – the first of all the services to declare IOC, deploy overseas, and conduct weapons school courses with the F-35.

“As a result, we have been at the forefront of lessons-learned with the aircraft in terms of sustainment, deployability, expeditionary operations and tactical employment.”

“We currently have a former USMC F/A-18 instructor pilot flying F-35As on an exchange tour with the USAF Weapons School, and we will soon have the first USAF F-35 exchange pilot coming to Yuma for a tour as instructor pilot in the F-35 division at MAWTS-1.

“We are all learning about employing, supporting and sustaining the F-35, and deploying it to places like the Western Pacific, where VMF-121 has been in place now a year.”

Question: During my time in Australia earlier this year, the Commander of the 11th Air Force raised a key question about the need for the USAF to ramp up its mobile basing capabilities.

How has the USAF interacted with the Marines at Yuma with regard to working through a new approach?

Col. Wellons: “Within the USMC, expeditionary operations are our bread and butter. In a contested environment, we will need to operate for hours at a base rather than weeks or months.

“At WTI we are working hard on mobile basing and, with the F-35, we are taking particular advantage of every opportunity to do distributed STOVL operations.

“It is a work in progress but at the heart of our DNA.

“We will fly an Osprey or C-130 to a FOB, bring in the F-35s, refuel them and load them with weapons while the engines are still running, and then depart. In a very short period of time, we are taking off with a full load of fuel and weapons, and the Ospreys and/or C-130s follow close behind.

“We are constantly working on solutions to speed up the process, like faster fuel-flow rates, and hasty maintenance in such situations.

“Of course, we have operated off of ships with our F-35s from the beginning, and that is certainly an expeditionary basing platform.

“We have been pleased with what we have seen so far in regard to F-35 readiness at WTI.

“For example, in the last WTI class we had six F-35s and we had five out of six up every day, which was certainly as good as anything we have seen with legacy aircraft.

“During the most recent class, F-35s supported us with over 95 sorties and a negligible cancellation rate.

“Our readiness rates at WTI are not representative of the fleet, where we continue to work on enhancing overall readiness goals with F-35.”

We then discussed the F-35 and USMC operations beyond MAWTS-1.

Col. Wellons: “This is still an early variant of this airplane.

“It is the early days for the F-35 and we are working things like software evolution.

“Yet the aircraft has already had an impact in the PACOM AOR.

“We can put this airplane anywhere in the world, sustain it and fly it and get a key deterrent impact, as we have already begun to see.”

Question: Looking back at your two and half years in command at MAWTS-1, what are some of your thoughts about the dynamics of change which you have seen while here?

Col. Wellons: “When I came here, the squadron was in great shape. I had the impression that what I needed to do was to focus on trying to sustain the standard of excellence that had already been established, because the squadron was really firing on all cylinders.

“I felt we were training at a world-class level and were training to the appropriate skills.

“But during my first year we faced dramatic and significant readiness challenges across Marine aviation, almost at an historic level.

“This led to significant reductions in the level of pilot proficiency and material readiness, and challenged our ability to meet training objectives during WTI.”

“The readiness cratering also impacted morale and placed our staff in a difficult position. If you have students that are coming to WTI that are barely qualified, who have just barely achieved the prerequisites necessary to come to a WTI class, that creates a risk management problem and makes it difficult to train at the graduate level.

“We were looking at dips in proficiency from flying 15-20 hours a month down to 10 or 11 hours a month or lower, and this required us to make some substantial adjustments to how we approached and ran the WTI class.

“Fortunately, this situation has dramatically changed for the better.

“During this last WTI course we had the highest level of readiness that I think we have ever seen for our fixed wing fleet, and our pilots are back above 20 hours a month across all communities.

“I would caution that we view this readiness recovery as fragile at this point, but it is definitely headed in the right direction.”

Question: Clearly, there is a strategic shift underway for US and allied forces to now operate in contested environments. That has happened during your time here.

How has that affected what you have had MAWTS-1 focus upon?

Col. Wellons: The team at 29 Palms as well as at Yuma have ramped up the contested and degraded environment that we present to our training audience at WTI and across all the other service level MAGTF training venues.

“We have challenged our students, especially this year, to operate in environments where communications and navigation systems are challenged, facing the most sophisticated and capable adversaries we can find.

“We focused on the idea that in the future fight our primary means of navigation and communication will probably be denied, and certainly degraded and our operators may have to use old fashioned techniques to get bombs on target.”

Question: You are clearly working what might be called F-35 2.0 while flushing out the dynamics of 1.0.

And one key area where that is happening is with regard to the sensor-shooter relationship.

We talked last year about this dynamic, what has been happening since then?

Col. Wellons: In part, it is about the transformation of the amphibious fleet whereby the shipboard strike systems or sensor systems can work with the reach of the F-35 as a fleet.

“For example, we see clear interest from the Navy’s side in exploiting 5th generation capabilities in the amphibious fleet using the Up-Gunned ESG, that will better leverage the capability they have got with the F-35.

“Naval integration will be a major line of effort in the WTI course going forward.”

“The F-35 is leading to a fundamental reworking of where we can take the sensor-shooter relationship.

“We tend to focus on the airplane’s sensor and how that sensor can go out and find a target and employ its own ordinance on that target.

“That is certainly something which the F-35 can do.

“But it can also enable an off-board shot, as in the case of HIMARS/F-35 integration.

“Or it can work with the G/ATOR radar on the ship or the ground to enable weapons solutions for other platforms in the distributed battlespace.

“It then becomes a question of how do I maximize the number of targets I can hit with the F-35 distributed force rather than how many targets can an individual fighter hit.”

“This is part of the combat learning we are working on at MAWTS-1 as well.”

Question: Assuming readiness remains at an appropriate level, what challenges do you see in the near term with regard to training?

Col. Wellons: Clearly, a major challenge we face is the limitations of our training ranges.

“We need to expand the potential of tasks we can do on these ranges to replicate a realistic and lethal contested environment.

“This is another consequence of our budget challenges in recent years, and we are pushing hard for upgrades of all our emitters, target sets, and simulation capability in order to enable full spectrum training at the high end.”

Footnotes:

1. Laird, Robbin; Timperlake, Edward; Weitz, Richard (2013-10-28). *Rebuilding American Military Power in the Pacific: A 21st-Century Strategy: A 21st-Century Strategy* (Praeger Security International) (pp. 258-259). ABC-CLIO. Kindle Edition.

MAWTS-1 Works Change: LtCol Ryan Schiller and His Team Discuss the Way Ahead

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This is magnified with the introduction of the F-35 which provides significant MAGTF organic support but also possesses capabilities to enable joint and allied fourth generation aircraft as well.

A key focus was how to manage and conduct Integrated Fire Control between G/ATOR and F-35.

“We focused on how to maximize three core systems – G/ATOR, the Composite Tracking Network (CTN) and CAC2S (the latest software iteration of the Common Aviation Command and Control System) as they are fielded to the force for the first time as a systemic whole.”

“We are going to be able to provide significantly greater information to all of the shooters, whether airborne, shipborne or ground based missile defense systems.”

A key challenge for the ADT&E Department at MAWTS-1 is to change the mindset of Marines in order to get them to understand and adopt new TTPs for new systems and not simply adopt a less effective legacy mindset.

In addition to TACDEMOs, the ADT&E Department continuously refines TTPs for the Fleet.

One TTP initiative conducted during the WTI course was Distributed STOVL operations (DSO) with the F-35, which is clearly a work in progress.

During the previous WTI they conducted DOS with MV-22 support, but during this course they did use a KC-130J.

“The KC-130J took off with Marines, ordnance, fuel and a security team.

“They landed at a remote facility, set up two forward arming and refueling points as well as a defensive perimeter.

“Shortly thereafter, two F-35s landed and received hot fuel and hot-loaded ordnance, then they took off and executed their mission.

“We are clearly working towards an expeditionary air base type of mindset for the force.”

They also integrated TTPs for both Group 4 and Group 1 UASs, both in an offensive capability as well as in a layered defense from threat UASs.

Finally, we discussed digital interoperability and its role in the evolution of the MAGTF.

And I had a chance to see and work with the MAGTAB.

This is a commercial tablet with an encrypted link to provide a means for the MAGTF to handle the transfer of relevant data throughout the Aviation Combat Element and Ground Combat Element (GCE).

The Marines have taken an off-the-shelf commercial technology and adapted it to provide core data communications capability within the USMC, and as one Marine put it, “have shown others in the joint force that you don’t have to write a complicated requirements document to get a cutting edge capability.

“This represents significant progress in terms of understanding how we can leverage commercial technology in the current fight while still meeting requirements to have low risk in terms of data protection and transmission security.”

During this WTI course, the ADT&E Department placed significant focus on creating a disrupted battlespace which included jamming, electronic warfare and other key non-kinetic elements.

Several members of the joint community also participated at WTI bringing advanced capabilities to play in the electronic warfare area.

The goal is to get Marines to proactively think about how the adversary will conduct battle so that strengths can be countered and weaknesses exploited.

It is also becoming more and more important to prepare Marines to incorporate the use of non-lethal disruptive technologies and techniques.

One of the MAWTS officers highlighted the fact that when Harriers drop bombs, the pilots and GCE can see the immediate effect.

But when they fly jamming pods, they do not see the immediate effect and can be frustrated.

“But their jamming effect could be much more significant than the bombs that they might have dropped in conflict.”

Learning how to engage in such a manner is part of the technology-training challenge as well.

The featured photo shows an AN/TPS-80 Ground/Air Task Oriented Radar starting up at Marine Corps Air Station Cherry Point, N.C., Feb. 26.

The AN/TPS-80 will replace the AN/TPS-63 and reduces set up time from eight hours to 30 minutes for the system.

Marine Air Control Squadron 2 received the first G/ATOR issued to the Fleet Marine Force following testing to improve the squadron's readiness and expeditionary capabilities.

CHERRY POINT, NC, UNITED STATES

02.26.2018

Photo by Lance Cpl. Ethan Pumphret

2nd Marine Aircraft Wing

In a story written by Monique Randolph and published by Marine Corps Systems Command on March 13, 2018, the the G/ATOR system was highlighted:

For the Marine Corps' Ground/Air Task Oriented Radar program office, reaching initial operating capability is a big deal—a momentous occasion, in fact. The one-of-a-kind radar system is more than 10 years in the making, but will help the Corps outpace emerging threats for decades to come.

“Most people, even in the acquisition field, don't understand how long it takes to deliver a radar [to the fleet]—it's a complex system, and the services only build them every 30 to 40 years,” said John Karlovich, program manager for GATOR/Ground-based Air Defense within Program Executive Officer Land Systems.

Unlike some other weapon systems, a radar is not something the military can buy commercially. They must be designed and customized to meet the precise needs of the service.

“We pretty much start with a clean sheet of paper and go from how to develop it, through development, to fielding and then sustainment,” he said. “The bulk of the 10-plus years to get to fielding was engineering and test centric, but the last year and a half and through the life of the system is sustainment and life-cycle support centric.”

For G/ATOR, that life cycle will be 30 years or more.

“A program—regardless of size or complexity—goes through the same steps, but there are transition points; we're in a transition point,” said Maj. James Thompson, military deputy for operations in the G/ATOR program office. “Once the system is fielded, you have to focus on spares, life-cycle sustainment, and operational assessment—meaning once you put the system in the hands of Marines, how are they going to use it? So now that we've fielded G/ATOR, we'll go through continued observation and user feedback, but at the same time, we have to sustain the systems we're putting out there.”

The program office works with Marine Corps Logistics Command, Global Combat Support System-Marine Corps, and Marine Corps Systems Command's supply entities to coordinate sustainment and logistics requirements.

The road to IOC was long, but it was worth the wait because Marines are now getting a system that will reap benefits for many years, Karlovich said.

G/ATOR is a next-generation sensor that works in concert with the Corps' existing Common Aviation Command and Control System, or CAC2S, and the Composite Tracking Network to provide connectivity with joint forces as well as across the Marine Air-Ground Task Force.

It replaces five legacy systems (two of which have been retired) with a single solution, and is the first air-cooled, active-array radar of its kind in the Department of Defense.

G/ATOR is lightweight, rugged and can be towed by the Medium Tactical Vehicle Replacement, and provides increased range and accuracy over the legacy systems.

An application-based software system allows G/ATOR to support both air and ground-based operations.

"This team took [G/ATOR] from concept to fielding—we delivered the most capable expeditionary ground radar of its kind," Karlovich said. "It's a quantum leap forward compared to existing radars, and does exactly what it's supposed to do in terms of providing dominant, peer/near-peer capabilities to the warfighter."

Two aviation units—Marine Air Control Squadron 1 in Yuma, Arizona, and MACS 2 in Cherry Point, N.C.—received their G/ATORS last month. They will put the systems through their paces during the Weapons and Tactics Instructor Course 2-18 exercise in Yuma in April.

"I think we'll get a lot of feedback from the Marines involved in that exercise because they can use [G/ATOR] the way they want to, rather than from a scripted test perspective," said Thompson. "They will use this system in ways we never thought possible."

As part of the operational testing phase, members of the G/ATOR team will travel to Yuma to observe the Marines using the radar, and collect data about any issues or problems they encounter. The exercise will also give the team an opportunity to gather feedback from the broader aviation community.

"WTI 2-18 involves the entire Air Combat Element, so they will all be paying attention to what this system can do and what [the Marines] are capable of doing now," Thompson said.

In all, the Corps will field 45 G/ATOR systems Marine Corps-wide by 2024. The next unit to receive it will be the 11th Marine Regiment at Camp Pendleton, California.

"We're not about having fair fights; we're about fielding a dominant capability," Karlovich said. "After undergoing a major reorganization and reset to the program in 2010, we've maintained constant schedule and performance requirements ever since. A lot of hard work was done by a lot of folks well before I got here to get us to this point. I'm very proud of this team."

MAWTS-1 Works F-35 Integration: The Case of HIMARS

By Robbin Laird

During my latest visit to MAWTS-1 in May 2018, the work of the MAWTS-1 team during WTI-18-2 was the focus of attention.

MAWTS-1 is working on reshaping Marine Corps approaches to moving forward from a primary focus on counter insurgency.

The strategic shift from counter-insurgency to contested operations was the focus of the most recent seminar of the [Williams Foundation](#) provides a baseline examination of the strategic shift.

At MAWTS-1, one can see the focus on the key building blocks for shaping a capability appropriate to mastering the strategic shift.

The shift is a significant one, which requires reshaping approaches, leveraging new capabilities, and integrating those capabilities into the overall evolution of the MAGTF.

It is a work in progress, and one driven by technology, combat experience and cross-learning from other US services as well as allies.

An example of the work in progress is providing a capability for an advanced ground based strike missile to operate with greater lethality when guided by a low observable air combat system which identifies targets beyond range of sight and not identified by the systems organic to that ground based strike system.

This is an example of how the sensor-shooter relationship needs to evolve when operating at greater distance and in a contested battlespace.

F-35 Integration with Ground Fire Systems: The Case of HIMARS from [SldInfo.com](#) on [Vimeo](#). October 19, 2017.

The core approach is to find ways to leverage the F-35 to provide an expanded aperture of support for the Ground Combat Element when executing the ground scheme of maneuver in a peer-to-peer conflict.

As the F-35 operates in its low observable mode and generates through its DAS and integrated sensors a battlefield situational awareness 'map,' targets can be identified deep within the enemy's operating area.

Targeting information can be generated to the Marines or to other joint forces to provide for precise fires targeting.

It is clear that the F-35 has an extraordinary sensor capability and sensor system integration, which can empower C2 in the operational battlespace.

In visits and discussions I have had with allied air forces flying the F-35 the use of the new systems was already evident.

In one case, an Air Force was using sensor data from its aircraft to provide significant SA to that ally's navy as well as other capabilities for the fleet as well.

In another case, an ally is flying a single F-35 along a border where low flying threats are crossing the border regularly with drugs, weapons and other undesirable deliveries onto that ally's territory.

The F-35 is providing coverage of the entire border area and delivering that information including guiding border forces to mission success.

The aircraft qua aircraft is part of the "renorming of airpower," but the capability of the aircraft's ultimate benefit is to leverage it as part of an information dominance capability, which is what I am calling F-35 2.0.

The Marines are clearly among the most inventive of forces in pursuing ways to leverage the F-35 as a multi-domain flying combat system.

But this is not simply going to happen without work of the aviation with the ground communities working closely together as they do at MAWTS-1.

For the Marines, working F-35 integration with HIMARS as one of the building blocks in F-35 2.0.

Last Fall, I discussed progress on this effort with the then Commanding Officer of MAWTS-1, Col Wellons, and one of his officers involved in the WTI course.

Question: Can you now describe the HIMARS integration with F-35?

Col Wellons: "This class we continued the learning process.

"We were able to validate and verify, via ground testing, the ability of the F-35 to share digital targeting information with a ground node

"But I will ask my Aviation Development, Tactics and Evaluation Department Head, LtCol Ryan Schiller, to further discuss the process."

LtCol Schiller: "Utilizing the targeting capabilities of the F-35 and its inherent survivability as a 5th-gen fighter combined with the standoff range and capability provided by HIMARS gives us a key capability to fight and strike in the A2/AD environment.

"We are clearly expanding the aperture of our focus on how to leverage the F-35 for the MAGTF.

"With regard to HIMARS we are looking to shipboard use in certain scenarios as well.

The progress continued at WTI-2-18 and I had a chance to discuss the way ahead with Major "Doctor: Buxton, MAWTS-1 Air Office Department, Major Andrew Crist, Fixed Wing Offensive Support Specialists, and Major Joshua Freeland, a Direct Air Support Control Officer.

What these officers described was a clear work in progress, one which will relied on leveraging software upgrades on the F-35 but concurrent progress with regard to the software and hardware evolutions of the data link systems as well.

From this point of view, the F-35, much like the Osprey before it, is playing a forcing function within the USMC for change.

With the Osprey, significant change was driven in how the Marines operated in the land wars, and in how they approached counter-insurgency operations.

The F-35 has come precisely at the point when the strategic shift is underway and it is clear that the US and the allies are using the F-35 as a trigger point for broader transformation as well.

And through this effort, the Marines are looking at broader issues of the F-35 and its role within the overall effort to shape greater digital interoperability for the force as well.

The GCE fires elements use a data link communication system, which operates by sending what is called K messages.

The immediate challenge was to find ways to work the F-35 systems with an ability to work with the data links used by the GCE.

The data links for the GCE are being reworked to be more effective in its operational integration with the Air Combat Element.

As the GCE receives new software and hardware systems and as the F-35 evolves to its 3-F configuration an ability to link systems more effectively in the distributed battlespace will be possible.

But the Marines are working the opportunity to do so prior to arrival of the optimal situation.

As one Marine put it: “We are looking to build in surface fires capability into the F-35.

“We started by looking at ways we could use CAC2S as a gateway to enable us to move in this direction.”

CAC2S is the USMC’s C2 system designed to provide for integration between the ACE and the GCE. It like the F-35 is a work in progress

As the Marine Corps has defined CAC2S:

CAC2S will provide a complete and coordinated modernization of Marine Air Command and Control System (MACCS) equipment.

CAC2S will eliminate current dissimilar systems and provide the MAGTF Combat Element with the hardware, software and facilities to effectively command, control and coordinate air operations integrated with naval, joint and/or combined C2 units.

CAC2S will comprise standardized modular and scalable tactical facilities, hardware and software that will significantly increase battlefield mobility and reduce the physical size and logistical footprint of the MACCS. CAC2S Phase 1 successfully completed its Initial Operational Test and Evaluation (IOT&E) in 2011.

Subsequently, Phase 1 received its full deployment decision on 25 Oct 2011 and limited deployment capability in February 2012.

Phase 2 successfully achieved Milestone C decision in 31 Mar 2015 and IOT&E in Apr 2016.

A Fielding Decision Review (FDR) was conducted on 11 Aug 2016 and ADM signed on 25 August 2016.

As the Marine Corps gets its updated versions of CAC2S, they are looking to the new capabilities to provide an effective gateway between the message set capabilities of the platforms.

The DASC or the Direct Air Support Center is where the translation and validation occurs on the battlefield and where Link 16 messages from the F-35 would then be translated into K messages for the GCE.

As another Marine put it: “Link 16 J series messages received by the DASC will then be translated into the K series format which the GCE utilizes to generate fire missions and is passed along to fires approval authorities with airspace clearance”

During WTI-2-18, the Marines used a new VIASAT radio as part of the firing sequence for the F-35/HIMARS tandem.

And with a handheld radio able to handle Link 16 messages, and the team was able to use a Link 16 data link from the F-35 to enable a HIMARS firing.

But it was clear that working the integration was a hard task, one that needs to become much simpler to be effectively operational on the battlefield.

What is impressive for sure is seeing the Marines work the process and in a way that can inform both the upgrade processes on the F-35 as well as with regard to HIMARS and related equipment.

Clearly, working the data links and communications is a key part of being able to operate on the distributed battlefield.

Although a work on progress, it is clearly working in the right direction towards the threat envelopes central to the nation.

Editor’s Note: in the 2017 USMC Aviation Plan, the way ahead for the ACE/GCE enablers was outlined.

As outlined in the 2016 Marine Corps Operational Concept (MOC) and throughout this year’s Marine Aviation Plan, the operating environment is evolving and our next conflict is largely unpredictable.

What remains constant though is the role of aviation’s enablers – the ability and credibility to control our own airspace and operate from expeditionary sites equates to MAGTF freedom of action.

As we field exponentially more capable systems, the ways in which the MACCS enables MAGTF freedom of action must evolve as well.

We now must refocus, innovate, and exploit the future of warfighting across the MAGTF in ways that are different from what has been done in recent history, such as recognizing the role information as a weapon and manning, training, and equipping a force where digital interoperability in the norm.

This transformation is what the aviation expeditionary enabler community has embarked upon.

The future MACCS and AGS communities will be highly expeditionary; operate in a distributed manner; and be capable of fusing and integrating MAGTF aviation command and control, sensor input and weapons data across the joint force to provide shared situational awareness and increase the decision space for the MAGTF commander.

Because of the unique position as the integrator between the ACE and GCE, the aviation enablers must ensure the ability to bridge divergent communication efforts within the MAGTF and joint force by providing beyond line-of-sight

(BLOS) tactical data links (TDLs), data forwarding, radio relay, tactical gateways, and ground-based air defense (GBAD) capable of engaging low radar cross section targets.

The most critical resource is the individual Marine.

As we transition to a common set of equipment, new operational concepts, and operations in complex battle spaces, we must transition to a training paradigm that provides baseline knowledge for all AC2 operators to excel.

The goal for MACCS operators is to become air command and control experts who will assist the commanders and decision makers in receiving and interpreting operational information and translating this information into effective direction and control for Marine aviation.

The primary missions for our tactical agencies will remain throughout our MACCS modernization. As new common sets of equipment are fielded, the ability to employ future hybrid agencies becomes relevant.

For example, the clearance requirements for extended range munitions have made knowledge of the ground situation and MAGTF fires critical for all MACCS agencies.

The proliferation and persistent presence of UAS and civilian aircraft through the AO require all MACCS agencies to have access to an air picture.

Integration with special operations forces and the increased capabilities of new MAGTF platforms, such as the F-35 and MV-22, will enable hybrid employment options for MACCS agencies as we modernize and align our equipment and personnel.

We must recognize the significant challenges of the future operating environment and develop an aligned approach to fight and win.

The MACCS and AGS communities enable the MAGTF commander to maintain control of the battlespace, maximize effects, and shorten the kill chain.

The next generation of aviation expeditionary enablers are approaching Initial Operational Capability (IOC) of our AC2 family of systems (CAC2S, TPS-80 G/ATOR, and CTN) and we are on pace to provide game-changing capabilities to the MAGTF ensuring continued freedom of action.

Integrating the ACE with the GCE: MAWTS-1 Meets the Challenge

By Robbin Laird

During my visit to MCAS Yuma in early May 2018, I had a chance to talk with several components of MAWTS-1.

We recently published the interview with the MAWTS-1 CO prior for his departure to his next assignment.

Colonel Wellons highlighted the importance of readiness for the Marines who would come into MAWTS-1 to get the advanced training one gets at MAWTS. He noted that there was a significant downturn in readiness, which is now on the upswing.

“During this last WTI course we had the highest level of readiness that I think we have ever seen for our fixed wing fleet, and our pilots are back above 20 hours a month across all communities.

“I would caution that we view this readiness recovery as fragile at this point, but it is definitely headed in the right direction.”

There is also the question of training for readiness for what?

What I found most impressive about the work going on at MAWTS was the focus on getting ready to fight with the force you have for the next war.

There was clearly a recognition of the strategic shift facing the liberal democracies and the need to prepare to fight in contested areas with the means which peer competitors can bring to the fight.

This clearly is a work in progress, but change is being driven as well by the innovations being introduced by the Marines working the innovative parts of the joint and allied forces as well.

For the Marines, the Osprey has driven significant change in terms of the reach of the Ground Combat Element; now the F-35 is empowering the air-ground team in new ways.

And next up will be the CH-53K, which will both benefit from the transformation of the Marine Corps but also contribute to it as well.

And certainly as MAWTS gets its hands on the CH-53K it will be shaped as a combat platform by the overall transformation of the Marine Corps.

A key element of the transformation is working a digital interoperable force, which can operate, effectively in a contested environment and to do so by highlighting force mobility and capability to operate as a distributed force.

All of these elements of change were on display at MAWTS-1 when I was there.

Perhaps no more so than in my discussions with two leaders of the Ground Combat team at MAWTS, Major Brian Green and Captain Thomas Fields.

The Ground-training element within MAWTS is a small part of the overall training of the Ground Combat Element in the USMC, and represents a special part of the overall effort.

The focus is upon exposing the GCE to the wide variety of air assets which can be brought into to support the GCE both within the MAGTF as well as from the Joint Force.

As Captain Fields put it: “We get a MEBs worth of aircraft for a WTI course, which is something our ground combat forces will not normally see.

“And they will get exposure as well to the other services air assets, which can be brought to bear on the battlespace.

“They get to understand that capability before they actually might employ it in the future.”

The involvement of the GCE has gone through an evolutionary process. According to the officers, it started with the involvement in 1988 of company working with MAWTS-1 a decade after MAWTS-1 had been established.

They participated but were not well integrated.

Then the GCE was upsized at WTI to a battalion level and the Marines began to operate the TALON Exercise, which is a ground combat exercise, concurrently with WTI and thereby providing exercise space for more interactive learning.

With the coming of the new air systems to the Marines, and the clear focus on digital interoperability, this interactive space becomes even more important in shaping concepts of operations and real world operational capabilities to deliver a more lethal force into the distributed battlespace.

Another part of the challenge is the return to the sea.

Major Green has significant at-sea experience, and with the emphasis on the return to the sea this means that the Navy needs to focus on its amphibious warfare skills as the Marines bring new approaches and capabilities to the sea base as well.

And this is clearly a work in progress, because with the decade of the land wars, skills in the amphibious are have been downplayed and some key skills atrophied.

This means the work at MAWTS-1 also needs to take into account the return to the sea and applying MAGTF integration to the sea base as well, which is clearly a work in progress as well.

Another key element of the work in progress is the introduction of digital interoperability as key line of development for the USMC.

Clearly, this is not just about the equipment but the soldiers working the equipment and learning how to maximize benefits from digital interoperability as well as to work with the downsides of data as well.

Major Green noted that there is a generation challenge associated with this.

“The younger generation are digital natives; the older officers are not.

“The senior level is wrapping their heads around the transition and working the challenge, but it is a challenge as well.”

An aspect of the training at MAWTS with the ground units, which come into the WTI course, is that they will study the same curriculum as the aviation community for the first two weeks of the 7 week course.

As Major Green put it: “We provide the same read aheads to the infantry as we do for the aviators.

“And we hold them to the same standards during the first two weeks of the course as well.”

After those first two weeks, the groups break out around their specific platforms but informed by the overall direction, which the Corps is taking with regard to cutting edge performance for the MAGTF.

The focus is not upon specialty or MOS training for the ground component, but certification as fire support team leaders.

And again, because of the wide panoply of aviation assets the ground force will see during the course and into the exercise, the notion of fire support becomes broadened as new capabilities are seen and understood.

As Major Green noted with regard to GCE involvement in MAWTS-1:

“We run two courses a year in conjunction with WTI. We typically have between 10 to 14 students tops.”

The target goal of the effort was highlighted by Captain Fields:

“When we receive our ground combat Marines, we will return them to their units in seven weeks and we’re going to return a subject matter expert on integration between air and ground assets and how to take a ground scheme maneuver and know how to integrate aviation assets to best support the ground scheme of maneuver in terms of fires, assault support, and sustainment.”

In short, MAWTS-1 provides a venue for the cross training which makes MAGTF innovation possible.

And with the strategic shift away from the counter-insurgency effort, there will be significant demands on the innovation curve.

A Key Challenge with the Strategic Shift: How to Prevail in a Disrupted and Degraded Combat Environment?

By Robbin Laird

During my visit to MAWTS-1 shortly after the completion of their latest WTI course, I had a chance to talk with Marines involved in the WTI about their combat focus.

In the strategic shift, an adversary clearly has access to a variety of advanced combat capabilities and techniques.

In a session led by Captain Michael Jacobellis, the Ground-Based Air Defense Division head at MAWTS, we focused on the threats and efforts to prevail against those threats.

One of these is the ability to degrade the combat force of the Marines and to disrupt the combat rhythm to the adversary's advantage.

Here the Marines were thrown a series of jamming and other EW challenges which disrupted their normal C2 and ISR data links and communication tools.

Clearly, part of that challenge is learning what is simply equipment malfunction versus a deliberate adversary disruptive strategy.

Part of it is learning to work with a diversity of targeting and communication tools to do work arounds when disruption comes.

Some of the new equipment is clearly designed to provide a combat advantage for the Marines, such as the new G/ATOR radar which provides targeting tracking information which can inform the air element as well as work with the ACE to provide redundant capabilities.

As one Marine noted with regard to G/ATOR: "We are working with a family of systems that will allow us to provide a recognized air picture across the entire MAGF so we can pass targeting data across the MAGTF as well.

"This system is the Composite Tracking Network or CTN.

"This was the first time we failed G/ATORS at WTI and they allow us through use of CTN to integrate all of the sensors together and empowers integrated fire control."

The shift from counter-insurgency habits, equipment and operations is a significant one and is clearly a work in progress.

It is about shedding some past learned behavior as well in terms of shaping more appropriate ways to operate as a force in a contested terrain warfare environment.

The cracking of the Enigma code in World War II by the allies involved in part German soldiers and sailors using techniques which exposed the enigma system to intrusive learning from the British and the other allies working to break the Enigma Code.

In today's situation, the Marines are facing a similar situation in which a combination of technology and appropriate combat techniques in handling data in a combat environment is a key element of the combat learning cycle as well.

And disruptive technologies, which the adversary might use against the Marines, were being fielded to test the USMC approach.

One example is the use of multiple drones or UAVs against Marine Corps forces and testing various technologies and approaches to attenuating that threat.

The Marines are working closely with the US Army and this effort, and our visit earlier this year to Fort Sill highlighted progress, which the US Army is making with regard to fielding a new capability to deal with UAVs disrupting the battlespace.

Similar to the Army, the USMC is working new systems onto a combat vehicle to shape more effective ways ahead as well.

The USMC system is called L-MADIS or the Light Marine Air Defense Integrated System, which is designed specifically for counter UAS missions.

It is a two vehicle system which works the ISR data, and C2 links and delivers a counter strike capability against incoming UAS systems.

The L-MADIS system is very expeditionary and can be carried by MV-22s or C-130s.

The Army's version is being built off of a Stryker vehicle, and the Marines off of a JLTV vehicle.

The same instinct is in play – use a core vehicle in use for the ground forces, shape a flexible management system on the vehicle and have modular upgradeable systems providing what BG McIntire at Fort Sill referred to as the “toys on top of the vehicle.”

<https://sldinfo.com/2018/04/the-us-army-innovation-and-shaping-a-way-ahead-for-missile-defense/>

<https://sldinfo.com/2018/01/shaping-a-21st-century-deterrence-in-depth-strategy-the-role-of-ada/>

In other words, combat learning can shape the systems being put onboard the vehicles and working commonality with the US Army can provide for a broader deployed capability dependent on how the force will operate or build up in an objective area.

The Marines are building the ground vehicle and systems infrastructure within which they can plug evolving counter-battery fires capabilities as those develop.

And clearly, they are looking at extended range as well for the counter-battery fire.

The C-RAM system of systems approach used in combat in the Middle East is being taken forward into the new phase of preparation for combat.

<https://defense.info/video-of-the-week/c-ram-a-case-study-of-army-transformation/>

We argued earlier with regard to the combat learning from the Middle East Wars, that one needed to “harvest the best and the leave the rest.”

Clearly, one aspect of the combat learning has been that Army and Marine Corps ground forces need to tap into similar capabilities when they have them to provide for enhanced joint capabilities.

The C-RAM opportunity is clearly one of them.

And generally, active defense capabilities have been highlighted again within combat preparations. The Marines rely on an upgraded Stinger missile and are looking forward to the introduction of directed energy weapons, again working closely with the US Army.

In short, the shift is a significant one.

It is a work in progress but clearly the Marines are working to reshape the force to be a more effective one in a force-on-force battle with peer competitors.

And given the worldwide working relationships of Marines with key allies preparing for the similar transition, the Marines can both contribute to allied learning and to learn from those allies as well.

VMX-1 Working a Way Ahead for the MAGTF

By Robbin Laird

What was clear from my visit to MAWTS-1 and getting a chance to look at the work of the latest WTI is that the Marines are working ways to enhance the combat capability of the MAGTF but in a way that can reach back to joint assets and shape evolving capabilities.

Enhancing the combat power of the MAGTF is unfolding as the reach of the MAGTF is extended back into the air and maritime strike capabilities of the joint force.

I have visited VMX-22 in the past, and VMX-22 played a major role in introducing the Osprey to the Marine Corps and shaping operational concepts for the use of the Osprey.

With the coming of the F-35, VMX-22 has become VMX-1, and has generated a broadening of the aperture of what the new combat air assets can do in the process of the transformation of the MAGTF and its reach back as well.

The CH-53K will soon come into this transformation process and will both contribute to and leverage the overall process of change.

Next up will be new remotes, including a Group 5 UAS, which certainly will enter the universe of VMX-1 at some point.

In a 2016 visit to Yuma, Ed Timperlake and I had a chance to talk with the first Commanding Officer of VMX-1, Col. George Rowell. In effect, what VMX-1 focuses upon is testing and working TTPs for aviation modernization for the USMC, with the F-35B as the latest key driver for change.

And later that year Todd Miller of the Second Line of Defense team visited the USS America to get updates on the ACE working onboard the new LHA and preparing for the future.

<https://sldinfo.com/2017/09/uss-america-flight-ops-at-sea/>

<https://sldinfo.com/2016/12/the-moment-pilots-first-realized-the-f-35-was-something-extraordinary/>

<https://sldinfo.com/2016/12/the-marines-onboard-the-uss-america-the-remaking-of-the-amphibious-strike-force/>

During this visit to Yuma in May 2018, I had a chance to talk with several members of VMX-1 during a roundtable discussion. Here we focused on an update on the Osprey, on the ongoing work with regard to the F-35B and the core effort to shape a digitally, interoperable MAGTF.

Currently, VMX-1 owns six F-35Bs with two in depot maintenance at Cherry Point and second undergoing modifications at Edwards AFB. Two of the officers at the roundtable have extensive experience working with the aircraft.

Major Brendan Walsh who has been flying F-35Bs since their standup at Eglin AFB provided an overview on the aircraft within MAGTF operations. He served as the operations officer for the Green Knights and worked their preparation for deployment to Japan. He now is leading the Marine Operational Test & Evaluation Squadron 1 F-35B Detachment at Edwards Air Force Base, CA., under the command of Col. Rowell. Major Walsh had just under 600 flight hours in the F-35B when we discussed his work during the roundtable.

A second Marine who discussed the F-35B from a strong basis of experience working with the aircraft was Major Paul Wright. Major Wright was originally a F-18 pilot but has worked through training and related F-35 activities to become a test pilot with VMX-1.

Major Walsh worked DT-3 as well where 12 F-35Bs operated with Ospreys onboard the USS America and supported assault operations in the San Clemente Island test area.

They underscored that the Osprey working with the F-35B enabled an ability to insert force into hostile areas of the sort being prioritized now with the strategic shift underway.

Given my recent visit to the UK and discussions at Marham and Portsmouth, I discussed with them their working relationship with the Brits. Not surprisingly, the two pilots emphasized the close working relationship but in so doing underscored a core point about the F-35 operating community worldwide.

As Maj. Wright put it: "I see the Brits on a daily basis at Edwards."

It should be noted that at Edwards all three US services flying the F-35 as well as the Brits and Dutch work with the USAF Test Squadron.

And as Maj. Walsh added with regard to their work experience at Edwards, "We fly together regularly and work together closely as well.

"It is great to work commonality and to understand differences as well with how the partners and the services are working the airplane as well."

The aircraft is a flying combat system with significant C2 and ISR capabilities.

And a clear challenge is task management with the aircraft as opposed to sensor management, which is what a legacy multi-mission fighter will focus upon.

As a multi-domain fighter, the focus of the information generated and displayed in the cockpit is about allowing the pilot to task manage and enable other fighters to be more lethal and survivable.

As Major Walsh put it: “With legacy platforms you would have one piece of the situational awareness puzzle and have to rely on other platforms to direct you.

“And we elevate the team operating around us.”

Major Wright added: “There is a culture or mindset change for the F-35 pilot compared to a legacy pilot.

“You work with the key information for the combat situation and can choose to employ your weapons, both lethal and non-lethal, against a target, or pass that information on and employ another asset in the attack phase of the OODA loop.”

Major Walsh then added with regard to his Red Flag experience in 2016: “If you look at what Vipers can achieve with and without the F-35, the difference is dramatic.

“You will find a lot of legacy platforms very happy to operate with F-35s for sure.”

One aspect of the Osprey working together with F-35s is the ability of the MV-22 to tank the F-35s, which provide a significant capability notably when operating off of ship or operating ashore in assault operations.

At MAWTS-1, they are working the STOVL distributed operations piece as well.

They have worked with the MV-22 providing the support last year, and at the last WTI, they used the C-130.

VMX-1 is clearly involved with shaping the TTPs for this operational capability.

The Marines initially worked the IOC support for the F-35, now they are working on leveraging the aircraft in its current configuration for the MAGTF and will spend the next couple of years working with the next iteration of the aircraft, the 3F software configuration and winging out its capabilities, notably for the Ground Combat Element.

The 3F will allow the aircraft to work with externally loaded ordinance for operational situations in which Low Observability is not the primary aspect of what is being required from the aircraft.

And while they are doing that, in the words of Major Wright, there will be a lot of “side projects’ with regard to leveraging the F-35 for the MAGTF as well.

With regard to the Osprey, the air system has evolved from the VMX-22 role of getting the aircraft into the force, to reworking the con-ops of the MAGTF leveraging the aircraft, to modifying aspects of the aircraft and its operations to optimize force insertion, to reshaping the aircraft to become a key part of the digital interoperability effort within the USMC.

Major Duchannes and Maj. Ryan Beni, also an MV-22 operator since 2009, and a Marine I had met earlier during a visit to Marine Corps Air Station New River, noted that the MV-22 has gone through several upgrades over the past few years, including upgraded communication systems and a new defensive weapons system.

“We are now working our way into the whole digital integration realm, so that we can empower the MAGTF more effectively as well as the Joint Force.”

The Osprey pioneered what might be called digitally enabled force insertion with the introduction of the MAGTAB into the squads operating on the Osprey and having the situational awareness to understand what had changed in the objective area during a long flight on Osprey to the objective area as well.

And working that digital interoperability piece is crucial for the F-35 as well as the Marines work the gateways and message systems to get benefit from the F-35 as it operates as a forward combat system enabling MAGTF operations.

This is a work in progress but a central focus for MAWTS-1 and VMX-1.

Editor's Note: In this 2016 USMC story about the role of Marine Operational Test & Evaluation Squadron 1 F-35B Detachment at Edwards Air Force Base, CA in 2016 testing, a good sense of what the Detachment does is provided.

Three F-35B aircraft and 75 U.S. Marines from Marine Operational Test & Evaluation Squadron 1 F-35B Detachment at Edwards Air Force Base, CA, along with 21 test personnel from the JSF Operational Test Team at Edwards deployed to Eglin AFB, FL., from August 9 to September 1, 2016 to complete Operational Test missile shots of the AIM-120 Advanced Medium-Range Air-to-Air Missile.

These employment scenarios differed from those conducted in Developmental Test in that they were specifically designed around operational employment scenarios with the aim of further validating and developing tactics, techniques, and procedures for all three variants of the F-35.

"Due to the commonality of the F-35 mission systems and weapons, everything we learned during this detachment directly translates to combat capabilities for the Marine Corps, our sister services, and partner countries," Lt. Col. Richard Rusnok, VMX-1 F-35B Detachment Officer-in-Charge, said of the test missile shoot.

The detachment completed multiple engineering runs in preparation for the expenditure of five AIM-120 missiles and one Guided Bomb Unit-12 LASER guided bomb. The operational test team developed complex air-to-air and air-to-ground scenarios and the F-35 weapons system performed as expected to deliver weapons on target.

On day one of live fire testing, the team was able to shoot two missiles on two separate test set-ups within 12 minutes – an exceptional level of efficiency in a test environment. Another test mission involved an F-35B dropping a GBU-12 and supporting it with LASER guidance while simultaneously engaging a QF-16 drone. Both weapons successfully guided to their targets.

"This was a phenomenally successful deployment that was made possible by the close coordination between the JSF Operational Test Team, U.S. Air Force, Navy, Marine Corps and industry," Rusnok said.

During the past year, VMX-1's F-35B Detachment has been involved in multiple high profile events including:

- ***Block 2B, 3i, and 3F Developmental Test support***
- ***Block 2B Air-to-Surface Weapon Delivery Evaluation Global Position System testing***
- ***A deployment to the United Kingdom in support of the Royal International Air Tattoo and Farnborough International Airshow***
- ***Upcoming events for VMX-1's F-35B Detachment include:***
 - ***Naval Integrated Fire Control – Counter Air testing***

Developmental Test Period 3 aboard USS AMERICA

“I want to congratulate the VMX-1 / JOTT team that did a magnificent job planning and executing this OT missile shoot,” Col. George Rowell, VMX-1 commanding officer said. “It is a huge achievement for the squadron and the F-35B program. We look forward to many more opportunities to provide positive impact.”

Marine Operational Test & Evaluation Squadron 1 is charged with testing the full range of Marine Aviation Combat Element (ACE) Operational Test and Evaluation including MV-22, CH-53E/K, F-35B, UH-1Y, AH-1W/Z, Command and Control Systems, and Unmanned Aerial Systems. VMX-1 is headquartered at MCAS Yuma, AZ, with detachments at Marine Corps Air Station New River, NC... and Edwards AFB, CA VMX-1 was formerly called VMX-22. The squadron's name changed on May 13, 2016.

[*An additional story published by the USMC which highlighted comments made by Major Walsh revolved around the participation of VMFA-121 in a 2016 Red Flag.*](#)

Six F-35B Lightning IIs with Marine Fighter Attack Squadron 121 participated in Red Flag 16-3, making it the first time in history that the fifth generation fighter has taken part in the three-week long exercise at Nellis Air Force Base, Nevada.

Red Flag is a multiservice air-to-air combat training exercise including the Army, Navy, Air Force and the Marine Corps.

According to Lt. Col. J.T. Bardo, commanding officer of VMFA-121, this is the first exercise of this magnitude that the F-35 has participated in and serves as a valuable training opportunity for the squadron.

During the training, VMFA-121 conducted defensive and offensive counter air exercises, strategic attacks, targeting, and combat search and rescue training.

“We’re really working on showcasing our surface-to-air capabilities,” said Maj. Brendan Walsh, an F-35 pilot with VMFA-121. “The F-35 is integrating by doing various roles in air-to-air and air-to-ground training.”

The F-35 is equipped with an integrated sensor package more powerful than any fighter aircraft, also combining radar-evading stealth with speed and fighter agility.

“With the stealth capability, the biggest thing that this aircraft brings that the others do not is situational awareness,” said Walsh. “The sensor sweep capability that the F-35 brings to the fight, not only builds those pictures for me, but for the other platforms as well. We’re able to share our knowledge of the battle space with the rest of the participants in order to make everyone more effective.”

Red Flag 16-3 has roughly 3,500 service members involved for the entire exercise. The training scenarios require all the branches to come together, which is extremely common in real-life battle scenarios.

“These opportunities to operate in a joint environment with our partner services are rare,” said Bardo. “We’re excited to be here, to bring the F-35 to the exercise and capitalize on all its strengths and integrate with the other players out there.”

The Strategic Shift and Enhanced Readiness: Raising the Bar on Maintainability

By Robbin Laird

Maintainability is a key aspect to ensure aircraft availability to support combat operations. The readiness crisis of the past few years has also included the challenge of upgrading maintenance support efforts as well.

The strategic shift from counter-insurgency to preparing for force-on-force conflict and a more rapid battle rhythm affects the maintenance side of the force as well. The wars in the desert have been tough on the aircraft, and pushing out their operational life has been a challenge.

But with a more rapid pace of combat as a key focus of attention, how to ensure better aircraft readiness, and fleet availability?

It is difficult to get a fleet approach if there is not commonality among the aircraft and understanding of best practice standards.

This will not happen without shaping the most effective standard practices for maintainers in supporting aircraft, and ensuring that there is an effective rhythm between maintenance to support daily operations and ensuring that a maintenance cycle that provides for aircraft to have regular maintenance that ensures longer performance cycles as well.

One way to address this is to ensure that best practices can be established throughout the maintainer force and have an evolving understanding of the best standards to achieve maintenance of each type model and series of aircraft.

[AAMOC at MAWTS-1: Getting Ready for the Strategic Shift](#) from [SldInfo.com](#) on [Vimeo](#).

For the Marines, a core focus is upon training maintainers who can work across a range of aircraft. The Marines are focused on expeditionary operations, and mobile basing. And this means, the Marines need maintainers who can support aircraft that operate from the mobile base, and not aircraft that need to go to Walgreens to be maintained by maintainers clearly divided into stove piped specialties.

And the introduction of new aircraft, ones that are software upgradeable, is clearly changing the system as well. The coming of the F-35 is driving change, and change which needs to be managed into shaping effective standardization as well.

And the F-35 highlights another change: the growing importance of the software management side of the equation.

In recognition of the central role, which enhanced maintainability, plays for the USMC in the context of the strategic shift a new course was brought to MAWTS last year. This new course and its role was well described in an article by [Captain Harley Robinson](#) published on March 15, 2017 by the 3rd Marine Air Wing.

A new course has been added to this year's Weapons and Tactics Instructor Course (WTI), held at Marine Corps Air Station Yuma, Arizona.

Advanced Aircraft Maintenance Officers Course (AAMOC) is a second-level graduate school for professional aircraft maintenance officers in the Marine Corps.

After the initial school for aircraft maintainers at Naval Air Station Whiting Field, Florida, there are limited follow-on training opportunities. AAMOC is the first of its kind and the expectation is to increase standardization, improve aircraft readiness and to minimize aircraft mishaps.

“Our primary school we go to is a Navy school, and that program is extremely successful for the Navy and its officers, but when Marines graduate, we train slightly different once we leave the school,” said 1st Lt. Jared Hasson, an assistant aircraft maintenance officer with Marine Aviation Weapons and Tactics Squadron (MAWTS) One and AAMOC instructor from Winter Haven, Florida.

In an ever-evolving job field, the course’s main purpose is to create a higher understanding and standardized learning platform for professional maintenance officers.

“There are training gaps with what is taught in the school house and what is actually being done in the fleet,” said Capt. Scott Campbell, an a chief instructor and AAMOC developer from Amarillo, Texas. “This class is an attempt to formalize, consolidate and structure information that goes into the fleet that isn’t getting taught to the Marines.”

The curriculum consists of an initial and final exam, roughly 62 hours of academic course work and additional training outside the classroom. There will be daily evaluations of the students by the instructors on class work, practical application and projects. The students will receive grades on every subject and must maintain an 80% grade average to graduate. The course will run a total of seven weeks.

“If every person in the class room is able to walk away with something they didn’t know beforehand, then I would deem this a success,” said Campbell. “This isn’t going to immediately stem the flow or in no way is designed to be the sole thing that fixes aircraft readiness. But teaching our maintenance officers how to better utilize their aircraft, where the demand of the aircraft comes from and how to manage that, absolutely contributes to better readiness numbers.”

Graduation is scheduled for April 30, which is the end of WTI. Graduates from AAMOC will be granted signing authority for 2000 level codes in the newly minted T&R manual, and will have the title of Maintenance and Training Instructors (MTI).

During my visit to MAWTS-1, this April, I had a chance to meet with Captain Campbell and Lt. Hasson and to discuss this fleet focus. It was quite an experience.

I have never encountered more enthusiastic maintainers in my life, and listening to them it was clear that being a maintainer for today’s Marine Corps is a worthy calling in service of the nation.

It would be difficult for me to convey the sense of enthusiasm, passion and commitment these two Marine leaders provided in our discussion.

Suffice it to say, that the sense of urgency in getting the readiness upsurge and the re-set of maintenance standards is a core part of reshaping the force and getting ready for the next fight.

Their core effort is upon reshaping the culture of maintenance in the USMC.

They are focusing on what they can do at their level and have targeted their efforts on enhanced training and effectiveness of those Marine Corps officers who are training the maintainers.

By so doing, they are generating a ripple effect throughout the maintenance culture of the USMC itself.

According to Captain Campbell:

“What is our objective with The Advanced Aircraft Maintenance Officers Course?”

“What we’re doing is standardizing the MOS.

“Because I can’t control, at my level as a company-grade officer, contracts. I’m not going to be able to control procurement.

“So what can I control?”

“We are focused on how we do things; how we share knowledge about best practices and how we keep from having to keep reinventing the wheel.”

He highlighted the inventive quality of Marines, which is a plus, but the downside is that unshared individual innovations will not drive overall change unless knowledge is shared and best practices are determined.

And the course is taught in such a manner that whatever the baseline of the course going in, it is altered in the interactions with the students and articulation of best practices.

For the WTIs a large number of Marine Corps aircraft come to the course, to the exercise. This provides an opportunity to bring significant experience from throughout the Marine Corps with different aircraft concentrated in Yuma.

And this provides a significant learning opportunity.

As Captain Campbell put it: “The maintainers comes to Yuma as if on a deployment.

“They are in barracks together and they generally don’t know one another.

“They cross learn during their time at WTI and with regard to the course, those participating in the course will shape a cross learning network which informs the course and provides an interactive baseline as we push forward effective standardization.”

1st Lt. Jared Hasson underscored that they have in the class maintainers who are new to the game and those who have written the book with regard to particular aircraft.

“At the outset, the gray beards look around and ask why are the newbies here?”

“We wrote the book.

“But then the newbies challenge the way things are done and look for new ways to do things and soon a cross learning process is underway.”

The course is part of an effort to generate broader understanding throughout the maintenance community of best practices and how to work from the evolved best practices to generating further progress.

An example cited by Captain Campbell was with regard to the F-35. He worked earlier on the F-35 and one of the concerns was how to get the F-35 maintenance system to plug into and work with the broader Marine Corps Maintenance IT system.

He noted that the Green Knights are currently deployed at sea and they are sorting this out. His task then is to find out how they have done it, and move that learning into the course and then share the knowledge so that the Marines do not have to have one-off learning efforts; rather they want to shape a learning curve.

Captain Campbell also underscored that the coming of the F-35 highlighted another change. “More of our maintenance is going to come from software and avionics than anything else.”

1st Lt. Jared Hasson highlight another aspect of their work at MAWTS-1, namely generating Capstone projects. These projects are generated by the students to develop point papers on a subject of their interest and work through ways to deal with a problem of their own choosing.

“They figure out how to address the problem; and they work on that throughout the course. And at the end of the course, they present their capstone project findings and some of these projects come to the attention then of the Naval Postgraduate School which then further pursue them.”

And shaping best practices is a key element for enhancing readiness and maintainability of the ACE. Bringing a new focus within MAWTS-1 to this challenge certainly will help the overall efforts to transform the force going forward.

The CH-53K and Its Intersection with USMC Transformation

By Robbin Laird

The CH-53k will replace the CH-53E. It will be the premier heavy lift helicopter. It has a number of key performance characteristics which make it a significant upgrade over the CH-53E, notably, an ability to carry three times of the external load of the CH-53E.

There are a number of key enhancements of the K over the E understood as a platform. Certainly important, the overall impact of the new aircraft would be missed unless, its coming to the MAGTF is not understood in the context of the transformation of the MAGTF itself.

Put in other words, the CH-53K is entering USMC operations when those operations are being fundamentally reworked to operate in a new strategic context and in the context of fundamental change for the MAGTF itself.

There is a strategic shift underway from the primary focus on counter-insurgency to crisis management in contested operational environments against peer adversaries. The experience of the counter-insurgency years has little relevance to how to generate forces which can prevail in a force-on-force conflict and notably to be central to how to manage in such situations.

The Marine Corps clearly gets this point.

My recent visit to MAWTS-1 and to discuss their recent work during their WTI exercise underscores the transition. Across the board, the Marines are working the challenge of operating in a force-on-force contested environment.

And the skill sets of the counter-insurgency years in many cases have to be unlearned and replaced with the skill sets of operating in a strategically different environment.

There is little time to lose in making the transition and learning the appropriate skill sets. And the Marines are looking to leverage new capabilities to enhance their transition as well. As noted in a recent article on WTI 2-18 by Steve Valinski, “a major focus in the past two WTI iterations has been Digital Interoperability (DI) which is an integral component of the Marine Corps goal of having every airframe capable of being a sensor, shooter and sharer. ‘DI continues to be a major focus throughout flight phase. Multiple Assault Support T/M/S are able to increase their SA through rapid information sharing, Major Miller told APD.”

The CH-53K is built from the ground up to be a DI aircraft and will be inserted into a Marine Corps which is being transformed by the crafting and evolution of DI and reshaping of the distributed combat force.

The shift from legacy to a 21st century system characterizes the movement from legacy heavy lift helicopters, like the Chinook or the CH-53E to the CH-53K. The CH-53K as a fly-by-wire aircraft is built around digital systems. In effect, modernization is built into the architecture, which allows for upgrades through a software evolution process, one informed by the operational experience of the combat force and that learning then informing the code rewrite process.

The CH-53K is a complete fly-by-wire architected platform. The cockpit is operating within an electronic environment which the flight control is run through the fly-by-wire electronic environment architecture.

The manufacturer can make a lot of changes along the way and given the different layers of flight control authority which is built into the architecture they can provide options for the pilots as well that allow them to mission managers or flight controllers dependent on where they are in the mission. And these capabilities evolve over time along with the software upgrades and changes.

When I visited the West Palm Beach facility last year of Sikorsky, I saw this digital migration process underway through the software modernization dynamic.

As one engineer commented:” As you saw, the ground test vehicle is a fully functional K but it simply does not do one thing – which is to fly. As you saw during the testing and training going on, the aircraft was working through a lift cycle but on the ground.

“The test vehicle has seen every single software drop since the beginning of flight test. The test vehicle has seen both hardware and software upgrades.”

“The ground test vehicle and the Engineering Demonstration Models or EDMs are key platforms, which enable testing of the block upgrades within the program itself.

“They are not prototypes.

“These aircraft have had every single upgrade along the way. This means that the first four EDMs will be able to be used by the government to continue to the ongoing software development effort, which will then inform the modernization of the operational aircraft.”

“This is a very different process from how the Es were designed and modernized for sure.”

This means that the DI capabilities of the K, combined with software upgradeability built into the aircraft allows the K to evolve along with the transformation of the MAGTF as a DI force as well as to be a key contributor to the process.

CH-53K: 21st Century Combat Ready Out of the Box

CH-53K is a Digitally Empowered Heavy Lift Helicopter

