

2019 Marine Corps
Aviation Plan





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Section 1 Marine Aviation Strategic and Operational Posture

1.1 Message from the Deputy Commandant for Aviation

1.2 The *National Defense Strategy* and the Marine Corps



READY TO FIGHT

The Marine Corps is an inherently naval organization - a combined-arms force organized, manned, trained and equipped to fight from the sea into austere environments. As a key component of the air-ground team, Marine aviation exists to support the Marine Air-Ground Task Force (MAGTF) commander and the scheme of maneuver. The goal of Marine Corps aviation, therefore, is to attain and maintain combat readiness to support expeditionary maneuver warfare. This is our identity.

The naval aviation enterprise of which we are a part keeps the nation ready, in any clime and in any place, to address threats as they arise. To do that, ships at sea employ expeditionary, amphibious and carrier-based forces ready to execute missions as tasked. Those missions often require rapid response; therefore, these forces are forward-deployed, ready to fight as required across the conflict continuum. Preparing for pacing threats, those presented by strategic competitors, means that we are also prepared for the lesser-included missions our MAGTFs – Marine Expeditionary Forces, Brigades and Units – might be called upon to execute.

The National Defense Strategy (NDS): Sharpening the American Military's Competitive Edge articulates the Defense Department's strategy to deter, compete, and win in the emerging and future security environment. This document states that "the reemergence of long-term strategic competition, rapid dispersion of technologies, and new concepts of warfare and competition that span the entire spectrum of conflict...requires a more lethal, resilient and rapidly innovating joint force."

These are our marching orders. The six functions of Marine aviation are designed to support the MAGTF, which in turn is aligned with both the National Military Strategy and this NDS.

With readiness trend lines moving up and our warfighting functions delineated, we now establish lines to maximize our strengths in building the joint force our Secretary of Defense has defined.

This requires a competitive approach to force development and a consistent, multiyear investment to restore warfighting readiness and field a lethal force. We will be key to a joint force with decisive advantage for any likely conflict, while remaining proficient across the entire spectrum of conflict.

Marine aviation remains agile and will continue to evolve as we always have: to innovate; to fly; to fight; to win.

Semper Fidelis,

A handwritten signature in black ink, appearing to read 'S. Rudder', with a stylized flourish at the end.

LtGen Steven R. Rudder

Deputy Commandant for Aviation

NATIONAL DEFENSE STRATEGY AND TODAY'S MARINE CORPS

Our Commandant has established direction and priorities to align the Marine Corps with the NDS. His overarching priorities are below.

Strengthen alliances and attract new partners

- Forward deploy, providing support to combatant commanders with ready, relevant crisis response forces and building capacity with partners and allies – the "fight tonight" force
- Conduct service-level, joint, and multilateral training exercises
- Enhance training range and live immersive training capabilities – train as we fight
- Sustain funding for the Indo-Pacific Force Posture Initiative and joint/naval force integration

Reform DoD for greater performance/affordability

- Achieve steady improvement in resource stewardship
- Continue a culture of innovation and reinvest savings in prioritized MCF2025 investments

Build a more lethal joint force - Increase lethality and capacity through investment in modernization and readiness

- Enhance capacity and capability to meet the requirements of the evolving operational environment
- Conduct full-spectrum cyber operations
- Increase infantry lethality
- Increase war reserves
- Fill the information warfare gap at the operational/tactical level
- Strengthen innovation and experimentation

These are the big-picture priorities: how the nation gets to geostrategic objectives, how the national military establishment executes the missions it is assigned, and how the Marine Corps fits inside that military effort.

We in the Marine Corps are focusing on specific systems, programs and innovations to make us a more-lethal operational force.

With aviation forces integral to the MAGTF, we are moving out on the Commandant's direction, including these aviation-specific areas:

Long Range/Precision Fires

- F-35B/C
- Future Vertical Lift

Information Warfare

- Intrepid Tiger II
- MAGTF UAS Expeditionary (MUX) - Group 5 UAS

C2 in a Degraded Environment

- Network-on-the-Move
- MAGTF digital interoperability and aircraft upgrades

Air Defense

- Ground/Air Task Oriented Radar (G/ATOR)
- Ground Based Air Defense – Future Weapons System
- Common Aviation Command and Control System (CAC2S)

Protected Mobility/Enhanced Maneuver

- CH-53K
- KC-130J



As we think about our warfighting functions and the support we provide the MAGTF, we break our missions down further into task-organized goals. We in Headquarters Marine Corps Aviation have the mission of manning, training and equipping the operational forces: we do our jobs so they can do theirs. Our jobs are as follows.

MODERNIZE KEY CAPABILITIES

Marine aviation will continue its modernization efforts, transitioning every one of our T/M/S aircraft and enabler systems, as well as balanced investments in legacy upgrades to increase lethality, survivability and readiness.

EVOLVE INNOVATIVE OPERATIONAL CONCEPTS

Modernization is not defined solely by hardware; it requires change in the ways we organize and employ forces. We must anticipate the

implications of new technologies on the battlefield, rigorously define the military problems anticipated in future conflict, and foster a culture of experimentation and calculated risk-taking. We must anticipate how competitors and adversaries will employ new operational concepts and technologies to attempt to defeat us, while developing operational concepts to sharpen our competitive advantages and enhance our lethality.

DEVELOP A LETHAL, AGILE, AND RESILIENT FORCE POSTURE AND EMPLOYMENT

Force posture and employment must be adaptable to account for the uncertainty that exists in the changing global strategic environment. Many of our force employment models and much of our posture date to the immediate post-Cold War era, when our military advantage was unchallenged and the primary threats were rogue regimes.

USE THE GLOBAL OPERATING MODEL

The Global Operating Model describes how the joint force will be postured and employed to achieve its competition and wartime missions. Foundational capabilities include: nuclear, cyber, space, C4ISR, strategic mobility, and counter WMD proliferation. It comprises four layers: contact, blunt, surge, and homeland. These are designed to help us cooperate more effectively below the level of armed conflict; delay, degrade, or deny adversary aggression, surge war-winning forces and manage conflict escalation, and defend the U.S. homeland.

EXECUTE DYNAMIC FORCE EMPLOYMENT

Dynamic Force Employment will prioritize maintaining the capacity and capabilities for major combat, while providing options for proactive and scalable MAGTF employment. A modernized Global Operating Model of combat-credible, flexible theater postures will enhance our ability to compete and provide freedom of maneuver during conflict, providing national decision-makers with better military options.

CULTIVATE WORKFORCE TALENT

Recruiting, developing, and retaining a high-quality military and civilian workforce is essential for warfighting success and dynamic force employment requires tough, thinking Marines across our force. Cultivating a lethal, agile force requires more than just new technologies and posture changes; it depends on the ability of our warfighters and the Department workforce to integrate new capabilities, adapt warfighting approaches, and change business practices to achieve mission success. The creativity and talent of the American warfighter is our greatest enduring strength, and one we do not take for granted.

Developing aviation leaders who are competent in operational decision-making requires broad revision of talent management among the armed services, including fellowships, civilian education, and assignments that increase understanding of interagency decision-making processes, as well as alliances and coalitions. This is talent management across the joint force.

Taking care of our people is critical to our readiness recovery – keeping skilled aircrew and, equally as important, experienced and qualified aircraft maintainers. This is the first year the Marine Corps has offered a flight bonus since 2009, and we’re also offering a bonus to our aircraft maintainers in order to retain talent and build experience. Aviation bonuses were targeted to specific MOSs – focused on fixed-wing aviators - and we had an overall acceptance rate of 74%. Additional aviation bonus opportunities will be used to further manage critical career paths.

	AV-8B	F-35	F/A-18	MV-22	Total
Approved Packages*	30	34	38	125	227
Eligible Population**	44	35	66	169	314
Take Rate	68%	97%	58%	73%	74%

Equally exciting is our success keeping talent on our flight lines. Within our maintainer ranks, 54% of the eligible Marines accepted the bonus. This means today we have nearly 700 qualified maintainers on our flight lines who are contributing to our recovery and building the next generation of Marine maintainer.



MODERNIZE KEY CAPABILITIES

We cannot expect success fighting tomorrow's conflicts with yesterday's weapons or equipment. To address the scope and pace of our competitors' and adversaries' ambitions and capabilities, we must invest in modernization of key capabilities through sustained, predictable budgets. Our backlog of deferred readiness, procurement, and modernization requirements has grown in the last decade and a half and can no longer be ignored. We will make targeted, disciplined increases in personnel and technology to meet key capability and capacity needs.

BUILD OUT COMMAND, CONTROL, COMMUNICATIONS, COMPUTERS AND INTELLIGENCE, SURVEILLANCE, AND RECONNAISSANCE (C4ISR)

Investments will prioritize developing resilient, survivable, federated networks and information ecosystems from the tactical level up to strategic planning. Investments will also prioritize capabilities to gain

and exploit information, deny competitors those same advantages, and enable us to defend against and hold accountable state or non-state actors during cyberattacks.

EMPHASIZE FORWARD FORCE MANEUVER AND POSTURE RESILIENCE

Our investments will prioritize ground, air, sea, and space forces that can deploy, survive, operate, maneuver, and regenerate in all domains while under attack. Transitioning from large, centralized, unhardened infrastructure to smaller, dispersed, resilient, adaptive basing that includes active and passive defenses will also be prioritized.

EXPEDITIONARY ADVANCED BASE OPERATIONS (EABO)

EABO is a future naval operational concept that mitigates peer competitors' anti-access / area denial capability by creating a more survivable, resilient, and persistent forward-postured force. The EABO concept is designed to re-establish the force credibility required to have a deterrent effect. Using key maritime terrain in the vicinity of close and confined seas, EABO provides decision-makers with sea denial options that are coercive, but not escalatory.

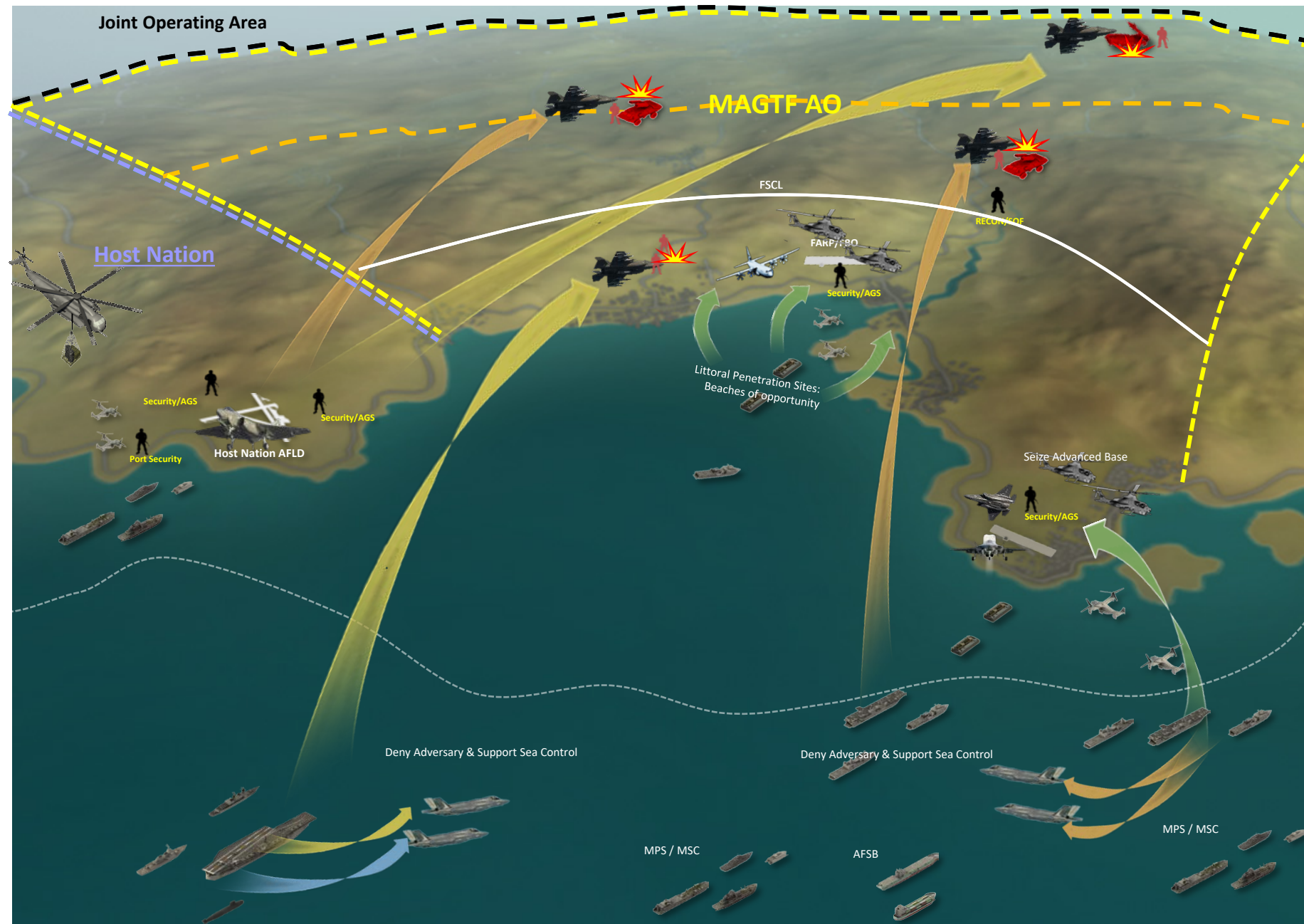
Nested within other naval and joint concepts such as Joint Access and Maneuver in the Global Commons (JAM-GC) and Littoral Operations in a Contested Environment (LOCE), EABO sustains and advances the inside force's ability to leverage the lethality of the outside force.

The EABO concept is comprised of low-signature, mobile, relatively low-cost capabilities operating in expeditionary and temporary locations. These capabilities provide the joint force commander with the ability to target and strike the adversary while also making up the backbone of an active maritime defense-in-depth.

EABO provides the Joint Force Maritime Component Commander (JFMCC) with sea denial options by using advanced bases to position and operate joint aircraft. All six functions of Marine aviation can be executed through the use of mobile and expeditionary EABs. By using all available basing options, Marine aviation can expand the reach and lethality of the joint force commander.



EXPEDITIONARY ADVANCED BASE OPERATIONS (EABO)





Section 2 Marine Aviation Readiness, Manpower, Logistics

2.1 Aviation Readiness

2.2 Aviation Manpower

2.3 Aviation Logistics

READINESS FOR COMBAT

COMPREHENSIVE READINESS RECOVERY

Marine aviation's focus is readiness for combat. We have aligned Marine aviation with the *National Defense Strategy* and remain confident in our ability to meet readiness goals. It is essential that we are ready to fight tonight. We will accomplish this by modernizing the force, supporting Marine maintainers, and continuing MAGTF integration. It is also essential to balance the material condition of our aircraft with our flight hour requirements. This balance ultimately improves aircrew proficiency and enables us to meet service goals and national directives. Meeting these readiness gains will be a testament to the capability of Marines. We must ensure the lessons learned during this recovery period are captured so we may be ready for any future fiscal uncertainty. Our pursuit of readiness recovery is working and we have made substantial gains in training and increasing the experience base of our Marines, but we are not yet complete. Our commitment to building a force capable of sustaining current demands and future contingencies must not diminish.

Readiness recovery initiatives, implemented from lessons learned from numerous independent readiness reviews, form the backbone of our recovery. Specific initiatives like the Depot Readiness Initiative (DRI), CH-53 Reset and the V-22 Readiness Program (VRP) are just a few actions Marine aviation has taken to meet the service's readiness objectives. DRI returns full mission capable (FMC) airframes to the flight line without a maintenance tax to the operational level. Currently, the program is succeeding, delivering FMC aircraft to the flight schedule in a matter of days and increasing the maintenance capacity at the operational level. CH-53 Reset returns long-term down aircraft to our strapped heavy-lift flight lines. These aircraft are now the backbone of the fleet, producing over 9,000 flight hours to date, increasing the T- rating of the community to service goals and reducing the cost per flight hour to sustainable levels.



The V-22 Readiness Program (VRP) expands upon the Common Configuration Readiness and Modernization (CC-RAM) program to include nacelle improvements. This comprehensive program increases the material condition and sustainability of this critical, operational asset. These initiatives are the highlights of a comprehensive readiness strategy that continues to evolve to meet new demands and challenges.

While our strategy's success can be measured in aircrew training gains and moderate material condition improvements, we are still challenged with low readiness rates in specific communities. Marine aviation made a commitment to accelerate the recovery of our TACAIR (F-35 and F/A-18) aircraft in this FY by achieving and sustaining an 80% mission capable rate in these platforms in accordance with the Secretary of Defense's directive. The Service remains confident in our ability to achieve this goal, but requires synchronized coordination with our industry partners, our depots, and our supply chains. This coordinated effort, combined with operating within the service's maintenance capacity, ensures the Marine Corps' ability to meet and sustain a material condition level that improves our combat lethality and achieves the service's Title X requirements as the force in readiness.

THE NAVAL AVIATION ENTERPRISE

The mission of the NAE is to maintain naval aviation as a warfighting force. It brings to bear the right capabilities, capacity, and wholeness for fighting and winning. Advancing and sustaining these core functions is smart, prudent, and responsible. For the Marine Corps, this means helping to ensure core capable units with mission capable aircraft, trained pilots, aircrew, and maintainers, and the parts required to keep them that way.

The NAE exists as a forum naval aviation stakeholders can use to share information, discuss challenges and barriers to achieving readiness, and ensure resources are used effectively. The NAE and its stakeholders know and accept the fact that they are interconnected and dependent on each other to achieve readiness goals. Actions taken by one stakeholder can have second and third order effects for other stakeholders. Without the enterprise, naval aviation does not function properly. naval aviation's leadership is committed to placing the welfare of naval aviation ahead of other self-interests to fulfill the NAE's mission which is to "sustain required current readiness and advance future warfighting capabilities at best possible cost."

The NAE does not make policy or direct. Those occur within each stakeholder's Title X Authority.

Marine aviation commanders and leaders – in concert with the NAE – will plan, execute, and manage the Return-to-Readiness (R2R) and Performance-to-Plan (P2P) processes to maximize equipment and personnel readiness. The focus must be on optimizing material resource allocations and expenditures while minimizing logistics downtime and delays.

The most direct measurable output of the CR process is the production of T-2.0 readiness. The design of CR, therefore, is to support mission essential task (MET)-based output standards that are consistent with a core competent unit (squadron or detachment).

Beginning in May of 2018, the PMAs, with the support of the TMS leads produced a Return-to-Readiness (R2R) three year plan. These plans shifted the focus from the fleet Air Boards to a PMA-led, cradle-to-grave-focused perspective. While the TMS leads continue to provide the feedback and fleet perspective for the enterprise, the PMAs are now the focus and primarily responsible for, not only the acquisition of the aircraft, but also the sustainment and readiness of the aircraft through sundown of the platform.

Stakeholder actions are critical to the success of naval aviation:

- Program executive office (PEO)/program manager (PM) address R2R and P2P
- Improve readiness of each TMS to service targets
- Expand Commander, Fleet Readiness Center (COMFRC) Aviation Rapid Action Team (ARAT) process to all TMS Teams
- Develop methodology for managing fully burdened operating and support (O and S) costs
- Apply O and S cost reduction initiative across all TMS platforms
- Implement the Integrated Logistics Support Management System (ILSMS) tool across all TMS Program Offices
- Streamline depot business operations in order to reduce turn around times
- Provide focus on both key readiness degraders and cost initiatives/progress
- Provide supply metrics to help understanding of cross-cutting issues
- Reduce Cost Per Flight Hour (CPFH) by the percentage assigned for each TMS while meeting readiness requirements
- Increase PM engagement in submission of affordability initiatives Future Readiness (FR) CFT

AVIATION MANPOWER

As the Marine Corps continues to modernize its fleet, aviation manpower remains the key to our ability to meet operational requirements. HQMC Aviation (ASM), Total Force Structure Division (TFSD), and Manpower and Reserve Affairs (M&RA) continue to work together with agencies across the enterprise and individual T/M/S cells to ensure that finite resources are properly managed. While each T/M/S is in a different place with regard to their individual lifecycle and inventory (and are addressed within their section of the AvPlan), holistically the Marine Corps must achieve targeted pilot and maintainer inventories, as well as build properly sized populations in grade, qualification, and experience levels. To realize these goals, we must focus on three lines of effort: production, readiness, and staffing.

PRODUCTION

Marine aviation must increase and balance aircrew and maintainer inventories to ensure the operating forces maintain combat readiness. To meet production requirements, the accession process, undergraduate flight school training, and capacity at fleet replacement squadrons must be properly managed and resourced. Additionally, HQMC Aviation is leading on ongoing effort to maximize efficiencies in the pipeline and seek opportunities to increase throughput wherever possible, without compromising the quality of training.

READINESS

Proper resourcing, depot maintenance throughput, flight line entitlement, and maintenance manning are all factors that contribute to aviation readiness. HQMC Aviation will continue to partner with the appropriate agencies to conduct periodic force structure reviews, promote aviation incentives and bonuses to ensure retention, and monitor inventory health to ensure the right Marine with the proper training and qualifications makes it to the right unit on time.



STAFFING

Developing a coordinated plan that ensures that the correct structure is allocated to the appropriate platforms at the right time is a key line of effort in support of the Marine Corps' continued modernization efforts while sustaining operational commitments around the world. While this is true throughout the inventory, developing a plan to adequately support operations in legacy aircraft while simultaneously transitioning to next generation aircraft with limited structure is a balancing act that requires the cooperative efforts of multiple agencies. Nowhere is this more evident than the F-35 transition, which as depicted in this year's AvPlan, is reflected in the Marine Corps' Total Force Structure Management System (TFSMS), and requires close coordination to ensure 3 different T/M/S are staffed and operated concurrently within the TACAIR community. Likewise, the FY18 MOS manual established the skill designator of 7511 for CH-53K-qualified pilots and 6053 for CH-53K-qualified enlisted maintenance personnel and aircrew. This is another example of the cross-functional work required to keep our modernization efforts moving forward.

F-35B AND F-35C LIGHTNING II PLAN MANPOWER

Overall, the requirements of TMS-specific MOSs in the Marine F-35 community continue to grow on par with squadron transitions. HQMC continues to work with fleet representatives to ensure a coordinated plan to provide fleet squadrons with the right people, training and equipment, while balancing the manpower necessary to continue in legacy operations until 2030. The manpower goal at HQMC Aviation is to get an accurate force structure requirement to provide the correct demand signal to planners and assignments monitors, which in turn will meet readiness requirements across the fleet.

The Marine Corps' Total Force Structure Management System (TFSMS) has been updated to reflect the F-35 transition as depicted in this year's AvPlan. The F-35 branch continues to focus on setting the correct conditions to match the overall force structure allocated for F-35 as operational usage reshapes organizational manpower requirements. There are several initiatives ongoing to ensure the correct force structure is in place to facilitate a smooth transition.

F-35 AVIATOR STAFFING

MOS 7518 pilot production will increase CAT I pilot training in FY20 while continuing to transition legacy TACAIR CAT II pilots for key F-35 squadron billets. Marine F-35C FRS instructor pilots are in position at the Navy FRSs and training the Marine Corps' first CAT I and CAT II pilots.

Growth in 7518 inventory is vital to ensure depth and agility to fill billets that assist with pilot production and meet operational demands. These demands must be balanced against the enduring professional and personal enhancing opportunities in and out of fleet F-35 squadrons.



F-35 ENLISTED STAFFING

F-35 aircraft requirements continue to evolve as the platform matures. Low observable maintenance and intermediate level maintenance- once thought to be excluded as manning requirements- are being included. As the Marine Corps continues to transition squadrons to the F-35, experienced manpower to support this transition will be critical. Enlisted manpower will continue to monitor the health of transitioning MOSs and target specific aviation MOSs to lateral move into the program.

F/A-18A-D HORNET (VMFA) PLAN MANPOWER

HQMC Aviation ensures the force structure requirement is accurate in order to provide the correct demand signal to planners and assignments monitors at Manpower and Reserve Affairs. The F/A-18 cell continues to analyze Hornet manpower requirements as the aircraft ages and approaches sundown. When appropriate and feasible, contract maintenance support (CMS) will be used to mitigate flight line maintenance manpower and experience shortfalls. The key to sustaining the F/A-18 pilot inventory is healthy FRS production. Efforts are underway to improve training throughput at VMFAT-101.

AV-8B HARRIER (VMA) PLAN MANPOWER

VMA structure requirements remain constant until FY21 when Harrier-related MOS requirements decrease with the sundown of VMAT-203. Officer and enlisted initial accession training will continue but at reduced numbers until the final years of the AV-8B.

Lateral moves into F-35-related MOSs will be considered on a case by case basis in accordance with the F-35B transition policy letter and will be balanced against VMA manpower requirements.

KC-130J/T HERCULES (VMGR) PLAN MANPOWER

Due to the continued demand for the KC-130, personnel tempo is the highest in Marine aviation. The structure of VMGR continues to be evaluated to ensure we have the right force to meet the requirement. The addition of Harvest HAWK in 2010 placed an added manpower requirement on the community, and initiatives like Future Force 2025 seek to provide additional manpower structure to meet this requirement.

Training and maintaining qualified crewmasters remains an issue for the community. The consolidation of the crew chief and loadmaster crew positions in 2009 has not yet realized desired efficiencies. Targeted adjustments to the T&R seek to make some improvement, but real strides will not be made until after the Enhanced Enlisted Aircrew Training Systems are delivered (FY20) and operating efficiently. Other near term solutions, such as hiring contracted crewmaster instructors will continue to be pursued. VMGR-452 is the last remaining legacy T-model squadron and sustaining manpower through the J-model transition is crucial. Maintaining qualified aircrew continues to be a challenge, the most immediate limitation being pilots. Processes are in place to train/sustain aircrew, with the biggest obstacle being recruiting well qualified pilots to grow an instructor cadre.

UH-1/AH-1 (HML/A) PLAN MANPOWER

TMS-specific MOSs in the Marine light /attack community continue to be healthy. However, as with the rest of Marine aviation, grade disparities within the aircrew and maintainer inventories still persist from the past 202K downsizing. HQMC Aviation ensures the force structure requirement is accurate in order to provide the correct demand signal to planners and assignments monitors at Manpower and Reserve Affairs. The Marine Corps' Total Force Structure Management System (TFSMS) and unit Tables of Organization reflect the H-1 transition as depicted in the AvPlan. The H-1 cell continues to focus on setting the proper conditions for the AH-1Z transition at MAG-29, while not increasing overall aviation force structure. HQMC Aviation has several ongoing initiatives to ensure the correct force structure and subsequent inventory is in place to complete the transition.

We anticipate growth in foreign military sales, and our H-1 cell is coordinating with the program office to ensure the appropriate resources are allocated for FMS training in order to avoid negative impacts to Marine training at the FRS. HQMC will right-size the UH-1Y crew chief community and align the promotion pyramid with other aviation maintenance and aircrew MOSs.

CH-53E AND K (HMH) PLAN MANPOWER

The Marine Corps' Total Force Structure Management System (TFSMS) and unit tables of organization reflect the majority of the CH-53K transition depicted in the AvPlan.

However, HQMC must still find structure for the planned activation of HMH-769(-) in FY23. The CH-53 cell continues to focus on setting proper conditions for the successful transition to the CH-53K, while not increasing overall aviation force structure. HQMC Aviation has several ongoing initiatives to ensure the correct force structure and subsequent inventory is in place to facilitate a smooth transition.



The FY18 MOS Manual established the skill designator of 7511 for CH-53K qualified pilots and 6053 for enlisted maintenance personnel and aircrew. Marines who meet the requirements for the MOS will be able to run 7511 or 6053 as an additional MOS in the Marine Corps Total Force System. The ability to identify personnel with CH-53K training will inform manpower processes and enable a successful transition by keeping trained personnel in critical billets.

We are updating the initial force structure laydown for CH-53K stakeholders to ensure complete developmental and operational testing as well as officer and enlisted student training. To that end, VMX-1 and HX-21 will have the necessary force structure to achieve the assigned tasks while building the inventory to staff HMHT-302 and HMH-366.

MV-22B OSPREY (VMM) PLAN MANPOWER

The VMM detachment structure is in place. Existing inventory shortfalls prevent actualization of full detachment staffing in the near term. We still have inventory shortfalls across the pilot and enlisted aircrew and maintainer populations. These shortfalls exacerbate the assignable inventory deficits. It is important to ensure the force structure requirement is accurate in order to provide the correct demand signal to planners and assignments monitors at Manpower and Reserve Affairs. Marine Corps TFSMS currently reflects the MV-22 transition depicted in the AvPlan. The MV-22 cell focuses on setting the proper conditions for the completion of the transition, while not increasing overall aviation force structure.

There are several initiatives ongoing to ensure future inventory is available during the transition. With the force structure and newer aircraft already in place, Marine aviation is focused on increasing capacity at VMMA-204 to meet current and future aircrew production. HQMC Aviation will continue to advocate for appropriate staffing levels to match increased flight hour capacity. Additionally, the MV-22 cell is working with the program office to ensure appropriate resources are allocated for future foreign military sales and interservice requirements in order to not impact Marine training at the FRS.

HQMC Aviation is concerned with the continued personnel deficit in the VMMs. Ultimately, the only solution is for the growing inventory requirement (stand-up of additional VMMs) to reach a steady-state condition while increasing student throughput (officer and enlisted) to close the gap. The growth in aircrew production has to be balanced with the fleet's ability to absorb and train Marines. We are analyzing VMM activation timelines to ensure inventory can support both existing and emerging manpower requirements.

UNMANNED AIRCRAFT SYSTEMS (VMU) PLAN MANPOWER

HQMC Aviation ensures the force structure requirement is accurate in order to provide the correct demand signal to planners and assignments monitors at manpower and reserve affairs.

7314 and 7315 PMOS inventory has lagged behind structure requirements, but the gap is closing each year. As initial cohorts finish their service obligations, retention rates and career designation acceptance rates will be monitored to inform future force shaping and retention efforts. As group 3 UAS capabilities are refined, MQ-9 operational support requirements are refined, and MUX manpower requirements are identified, proliferation of UAS billets throughout the MAGTF will be analyzed and applied.



MARINE AVIATION LOGISTICS PLAN

READINESS RECOVERY

Drawing on the findings of our Independent Readiness Reviews, Marine aviation has been active in readiness recovery efforts over the last several years. Efforts to date have largely been centered on fully funding our Aviation Supply accounts and other enabler accounts which will start to show a return on investment in the next year. Following these efforts, the Deputy Commandant for Aviation identified “Support the Maintainer” as one of his four key priorities, and the aviation logistics community is turning its attention to maximizing available maintenance capacity and strengthening our flying squadron maintenance departments. Strong maintenance departments are able to generate materially sound, healthy aircraft in the right numbers to enable our aircrews to be successful in training and in combat and set conditions for “operations and maintenance balance.” Fiscal Year 2019 will see the maturation of several initiatives designed to improve maintenance capacity and maximize maintenance man hours available to our squadrons. Maintenance departments serve as the “center of gravity” of our flying squadrons and maintenance capacity ultimately determines our ability to provide sustainable readiness in support of operational requirements.

Several actions are underway to establish the conditions to build combat readiness and support the maintainer. Right-sizing flight line inventories, “getting down to fighting weight”, and relieving workload surges currently facing our flying squadrons are top priorities. Current actions include erecting preservation facilities at three Marine Corps Air Stations in order to store and preserve backup aircraft inventory of H-1, AV-8B and F/A-18 A-D aircraft. HQMC Aviation is testing the concept of Marine Aviation Logistics Squadrons (MALS) performing the role of Aircraft Reporting Custodian for aircraft in off-site depot locations and in long-term preservation. Additionally, a cohesive Contract Maintenance Support (CMS) Strategy has evolved to target use of CMS for specific tasks such as flight-line preservation and long-term-down rebuild. The CMS Strategy will allow our maintenance departments to apply organic maintenance capacity more efficiently in order to groom aircraft and sustain readiness rates. Additionally, HQMC Aviation has championed an effort to have NAVAIR serve as the contracting authority for naval aviation which will ease the burden of awarding contracts and speed services to the fleet.



MARINE AVIATION LOGISTICS PLAN

READINESS RECOVERY

The Aviation Department will lead an effort to renew focus on 3M documentation at all levels. Proper documentation is necessary to capture system and component level reliability, repair turnaround time, and man-hour consumption at a detailed level. Inaccurate information in these areas misleads allocation of resources in a way that does not best support our maintenance personnel and flight hour generation capacity, while accurate information can lead to improved engineering decisions, spare parts procurement, and workforce management decisions at all levels.

The Maintenance Capacity Model (MCM) was developed by aircraft maintenance experts throughout the Marine Corps to measure maintenance capacity and expand maintenance personnel touch-time. It relies on understanding what has consistently delivered aircraft readiness in the past and identifying the appropriate behaviors to monitor to make "best-practices" measurable and repeatable. The metrics developed by the AVLOG community for MCM measure behaviors that are universally applicable to all type/model/series aircraft and actionable by Commanders and maintenance managers at every level. MCM is a tools-based concept that empowers leaders by measuring the ability of any unit to effectively employ workers by monitoring the number of workers engaged in maintenance each day and the direct maintenance man-hours per worker per workday.

This method is intended to shift the focus to the right behaviors in order to improve our ability to identify and remove the constraints to these behaviors.

MCM also measures the direct maintenance man-hours per flight hour (DMMH/FH) at the work center level in order to enable the calculations necessary to balance production capacity of the work centers with the flight hour plan of the command.

AVLOG Readiness recovery initiatives strive to either expand worker touch-time or reduce workload burden (DMMH/FH) in order to increase mission-capable materially-sound aircraft and expand flight hour capacity. MCM was tested at VMFA-251 between December 2018 and February 2019, and will be expanded to other units throughout 2019.

The CH-53E Reset program provides an excellent example of what is possible when we focus on generating materially sound aircraft and supporting the maintainer. Reset aircraft require less man hours to maintain and troubleshoot allowing maintainers to focus on other aircraft. Additionally, these aircraft match what maintainers see in technical publications and demonstrate to our maintainers "what right looks like." These aircraft provide far greater monthly flight hour generating capacity than non-Reset aircraft, cost less to operate and help to enable operations and maintenance balance.



MARINE AVIATION LOGISTICS PLAN

READINESS RECOVERY

The Depot Readiness Initiative (DRI) is another major initiative underway to build readiness and support the maintainer. The goal of DRI is to enable our flying squadron maintenance departments to break the current cycle of spending hundreds and sometimes thousands of man hours performing required deferred squadron-level maintenance when aircraft return from a depot event. These aircraft require excessive focus and deprive available manpower in order to return to flyable status, become Long Term Down, and then are cannibalized for parts required to keep the squadron's other aircraft flying. Under DRI, existing workload capacity at the Fleet Readiness Centers/depots will be utilized to perform tasks normally not performed at the depot level, relieving these frequent surges in workload from our flying squadrons and allowing for a quick return to flying status. DRI will address organizational-level maintenance tasks such as calendar inspections, hourly inspections, discrepancy maintenance actions, and the incorporation of technical directives. In the future, HQMC Aviation will pursue incorporating the DRI scope of work into depot-level work packages, funded via depot funding accounts in a move away from the Integrated Maintenance Concept. This will return available manhours back to the flight line without impacting flying hour program accounts.

EQUIPPING THE NEXT GENERATION MAINTAINER

As Marine aviation transitions to new aircraft and focuses on supporting the maintainer, updating the gear utilized by our enlisted maintainers is essential to improving productivity and professionalizing the workforce. Examples include enhancing and designing fall protection into maintenance stands, fielding a modern impact-resistant cranial, providing streamlined low-profile hearing protection, and developing a standardized fire and hydraulic resistant coverall are the first steps in updating how we outfit our maintainers. Installing Wi-Fi on Marine Corps Air Stations, paired with personal electronic devices, will maximize the maintainer's ability to access publications, sign-off maintenance



actions and document training. Removing time constraints through deliberately designed tool control centers with a single time-saving software suite, improved organization of tools and support equipment, and a workforce trained and organized to deliver usable tools [e.g. modern flashlights and tool containers] and Individual Material Readiness List (IMRL) support equipment from test stands to new Portable Electronic Maintenance Aid (PEMA) carts to the maintainer seamlessly every time it is required. Providing the maintainer with the tools and equipment necessary to increase their effectiveness in maintaining aircraft and manage programs, while at the same time enhancing safety and removing barriers that currently prevent our maintainers from working on aircraft are key elements to maximize maintainer effectiveness.

MARINE AVIATION LOGISTICS PLAN

AVIATION LOGISTICS STRATEGY AND INNOVATION

As the Marine Corps continues to integrate 5th generation aircraft into the inventory, aviation logisticians are actively pursuing new technologies that will enable our Marines to maintain both legacy and 5th generation aircraft while ensuring the highest level of safety and material readiness in support of operations and training. Experience with current platforms demonstrates the enduring requirement an Intermediate Level (I-Level) of maintenance for all supported platforms.

While the exact size and scope vary by platform, HQMC Aviation will seek to define Intermediate level requirements in the coming year. We must maximize the efficiency of the enterprise through careful management of individual component repair capabilities and considerations for aviation supply, aviation ordnance and avionics capabilities. This is most visible in our ongoing effort to expand capability to support F-35, V-22 and H-1.

The Aviation Logistics and Support Branch (ASL) continues to push innovative solutions for our aviation logisticians of every type to include additive technologies, enhanced computing capability, increased logistics collaboration with ground units, unmanned aerial delivery systems, and partnering with academia and industry to keep pace with emerging technologies. Enhancing our Marines' ability to conduct effective maintenance while increasing maintenance capacity on aircraft and aeronautical components.

ADDITIVE MANUFACTURING

In the summer of 2018, HQMC Aviation released MARADMIN 209/18, which established guidance for additive manufacturing employment and the Additive Manufacturing Working Group. Additive manufacturing technology for polymer component production has been pushed to the Intermediate Levels of maintenance and the projected benefits are immense.

Job aid production is saving direct maintenance man hours and prototyping is setting quality standards for future prints. Future equipment for producing metal components is possible as industry technology matures to producing safe to handle metal materials. While working in concert with Naval Air Systems Command to safely manufacture aeronautical components, Marine Corps aviation produces technical data packages now that will speed up the approval process in the future.



MARINE AVIATION LOGISTICS PLAN

AVLOG CONTINUUM OF EDUCATION

Properly trained maintainers and maintenance managers are the bedrock of strong maintenance community. The training continuum starts with leaders, including 75XX squadron commanding officers and Aircraft Maintenance Officers (AMOs), and flows holistically through staff non-commissioned officers and junior officers to entry level technicians and young crew supervisors. Marine aviation champions a “training is continuous” philosophy whereby maintainers and managers receive performance-based and criterion-referenced instruction that promotes student transfer of learning from the instructional setting to on-the-job training. Multiple technical and managerial training initiatives focused on post-accession maintenance personnel have been implemented, with future training actions dedicated to formal schools and graduate-level curriculum development that is tracked by additional Military Occupational Specialty designations and Training and Readiness progression reported through the Advanced Skills Management (ASM) system. Aviation will continue to **leverage MAWTS as a repository for Marine aviation fleet-wide maintenance best practices and MATSG-23 to shape formal school curricula.**

ADVANCED AVIATION MAINTENANCE OFFICER COURSE

The most critical element and cornerstone of maintenance training is the Advanced Aviation Maintenance Officer Course (AAMOC). AAMOC is designed to instill and codify critical management skills within department-level leaders in order to achieve a common and predictable managing style across flying squadrons which will enable institutional improvements in resource management. This course is delivered bi-annually by MAWTS-1 maintenance leaders and experienced guest-lecturers concurrently with Weapons and Tactics Instructor courses and encompasses 120 hours over seven weeks, including 83 classes and 16 practical applications.



The target student populations are chief warrant officers, lieutenants, and captains who are currently filling the billet of Maintenance Material Control Officer at the organizational level.

It is the responsibility of the MAW and MAG Aircraft Maintenance Officers to employ their AAMOC graduates to provide formal classes and begin to grow management knowledge throughout all levels of manager from the shift-supervisor to the division officer.

MAWTS MAINTENANCE MANAGEMENT COURSE (3MC)

In addition to AAMOC, MAWTS-1 delivers the MAWTS Maintenance Management Course (3MC). This period of instruction is independent of WTI courses and targets Expeditionary Warfare School Aviation Combat Element (ACE) Occupational Field Expansion Course (OFEC) students, fleet 75XX Aircraft Maintenance Officers, Assistant Aircraft Maintenance Officers, Quality Assurance Officers, Maintenance Chiefs, and Maintenance Controllers. The pilot 3MC was conducted during the Spring 2018 WTI class.

MARINE AVIATION LOGISTICS PLAN

AVIONICS OFFICER AND AVIONICS CHIEF COURSE

ASL, in conjunction with TECOM and CNATT, is developing a curriculum and formal course for newly promoted Avionics Officers (AVOs) and Avionics Chiefs (AVCs) at the Master Sergeant Rank. Currently in the Curriculum Development phase, the AVO/AVC course will address proficiency levels required by commands from those subject matter experts to include aircraft survivability equipment, electronic countermeasures equipment, electronic keying material, laser system safety, digital interoperability, and 5th generation avionics systems.

ADVANCED WIRE REPAIR TRAINING

Aging aircraft and declining material condition across every T/M/S are impacting all wiring types and severely affecting current readiness. Currently, there is inadequate journeyman level wire maintenance and repair training and familiarity within the maintenance community. ASL, in conjunction with TECOM, CNATT and the NAVAIR Wiring Branch, have established Just in Time Training that provides advanced wire repair techniques to fleet personnel. The program is currently funded through FY19 but is limited in effectiveness due to capacity constraints within the training pipeline.

ASL and CNATT are currently in the process of curriculum development, which ultimately is expected to result in a formalized joint Navy and Marine Corps Advanced Wire Repair course, beginning its multi-site implementation, by the 2nd quarter of FY20.

AIRCRAFT MAINTENANCE ENGINEER OFFICERS COURSE

Investing in the training of our restricted officer community cannot be overlooked. Rather than rely on a re-introduction to and familiarization of the Naval Aviation Maintenance Program (NAMPP), a new course is being designed, managed, and taught exclusively by

experienced restricted AMOs (MOS 6004). This course will better prepare future MMCOs for the fleet, help them “hit the ground running” at the O-Level, and perform at a higher level of competency. In addition to training at Whiting Field, this course is envisioned to be executed by MAWTS-1 Maintenance Staff and leveraging CNATT courses. MAWTS-1 has been identified as the logical location because of its inherent experience, knowledge, and their new role as the repository of best aviation maintenance practices for the Marine Corps. The pilot class is scheduled for 3rd quarter of FY19.

ONGOING TRAINING IMPROVEMENTS

ASL continues to explore opportunities to improve training tools and processes through engagement with industry. From virtual reality to software improvements within the Advanced Skill Management system, we are pursuing revolutionary and incremental improvements. These efforts will enable the next generation of aviation logistics Marines from warehouse managers to aircraft mechanics to perform increasingly complex tasks in resource constrained environments that demand high operational tempo.

AVIATION LOGISTICS MANAGEMENT ASSIST TEAM STANDARDIZATION

Consistent performance depends on repeatable measurement. Calendar year 2018 saw the introduction of a standardized points-based-grading system for ALMAT audits. The four MAW ALMATs have established a formal method of standardization and will continue their efforts to improve the management models provided to managers at every level. Points based grades will improve diagnosis of systemic problems and the design and fielding of tools-based solutions for the future.

MARINE AVIATION LOGISTICS PLAN

TRAINING AND READINESS (T&R)

Building and sustaining the requisite experience levels in our squadrons is challenging. The Aviation Maintenance and Supply Training and Readiness Program (AMSTRP) provides standardized training requirements that are documented in the Advanced Skills Management (ASM) training management system. T&R manuals contain individual training syllabi for applicable Military Occupational Specialties within an AVLOG community. Individual proficiency is based on specific requirements and performance standards to ensure aviation assets are maintained through required system and subsystem skill proficiency. ASM provides data to maintenance managers in order to measure, analyze, and report individual and departmental T&R completion rates and required Qualifications, Certifications, and Licenses. ASM data, coupled with maintenance and material management (3M) metrics, provides squadron maintenance managers and leadership with facts regarding measurable capacity and the health and effectiveness of the maintenance department.

Aircraft touch-time is central to both building experience within the workforce and ensuring the efficient application of available manpower. Currently, no individual standard exists for aircraft touch-time. Much like pilots track and report flight hours per aircrew per month, ASL is developing Key Performance Indicators (KPI) that measure aircraft touch-time in an actionable way that will feed iterative development of further KPI. New touch-time KPI are:

- Direct Maintenance Man Hours per Worker per Day
- Workers Performing Maintenance per Day
- Direct Maintenance Man Hours per Flight Hour per Work Center

We are developing tools for calculating these KPI at the work center.

Below Average Units				Average Units			
Unit	DMMH/ W/D	DMMH /FH	W Avg	Unit	DMMH/ W/D	DMMH/ FH	W Avg
VMFA-3	2.22	19.24	46.75	HML/A-2	3.3	14.07	67.6
VMFA-2	2.48	13.28	51.84	HMH-1	3.49	47.5	60.81
VMFA-1	2.49	41.13	41.13	VMM-3	3.5	39.57	59.72
VMA-2	2.92	39.9	53.57	VMM-2	3.79	67.87	42.77
VMA-1	2.96	30.81	57.37	VMM-1	3.85	41.51	44.82
				HML/A-2	3.88	16.17	73.66

AVIATION INFORMATION SYSTEMS

Along with a renewed focus on 3M documentation at all levels, tools are being developed to improve the understanding of resource managers at every level of constraints which restrict productivity. Accurate documentation can be used to justify investment, and the fleet must strive to accurately define problems through accurate work orders. The most important element is the replacement for Optimized Organizational Maintenance Activity (OOMA) Naval Aviation Logistics Command Information System (NALCOMIS) which is currently under development.

ASL and operational subject matter experts have been integrally involved in the development of the Naval Aviation Maintenance System (NAMS), which is the replacement of current OOMA NALCOMIS. Over the course of FY19, the NAMS prototype will be constructed using requirements captured over the last year. NAMS will simplify and upgrade the current user interface and facilitate a higher degree of maintenance documentation fidelity and analysis to inform better decisions from tactical to strategic level decision makers.

MARINE AVIATION LOGISTICS PLAN

AVIATION SUPPLY

RETAIL SUPPLY CHAIN MODERNIZATION

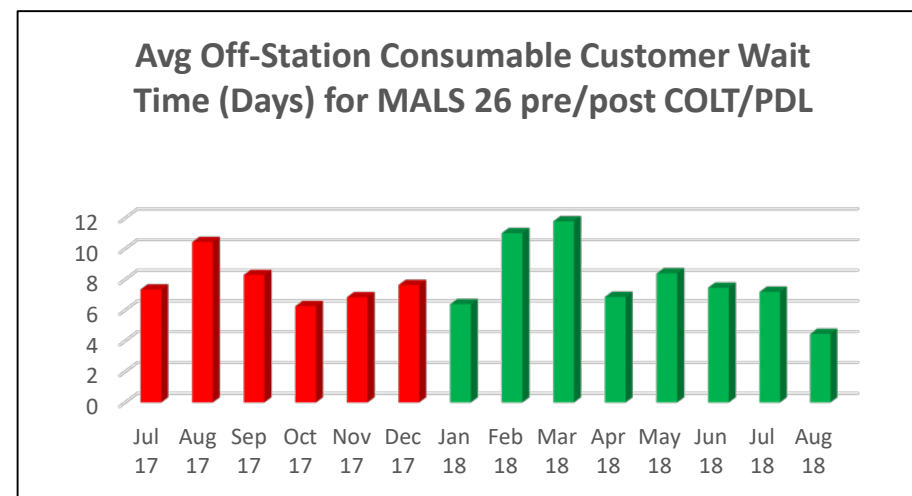
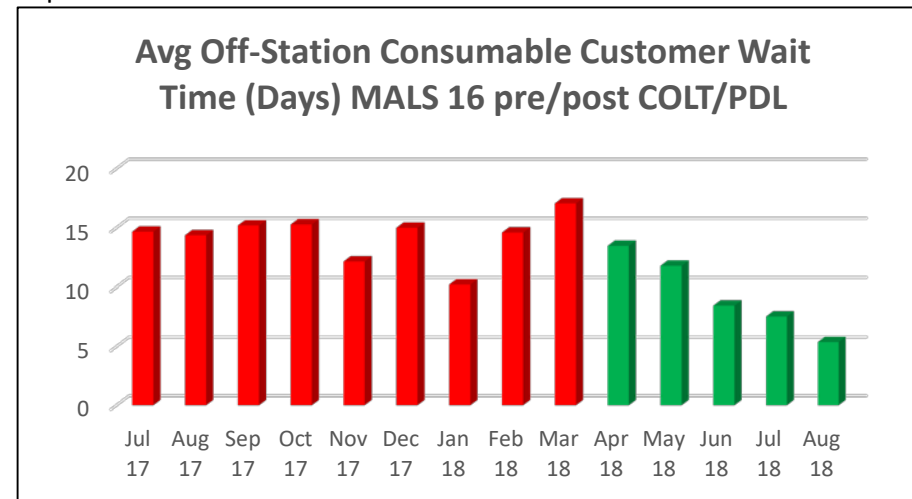
In an effort to improve material support to our flying squadrons, the aviation supply community is embarking on a significant restructuring of the Marine Corps' tactical level supply chain that will increase efficiency, reduce variance in performance, and eliminate redundant work currently performed at each MALS. The future construct will be achieved without additional investment in IT solutions, additional manpower structure, or facilities – it is simply a better use of resources we already have.

The effort will involve both a restructuring of the Aviation Supply Department within each MALS and the centralization of some functions at the Marine Aircraft Wings (MAWs). The centralization will produce more consistent performance of the supply chain while improving interaction with the supply chain activities that support Marine aviation. The re-alignment of processes away from the MALS and flight line will produce efficiencies of scale and experience while simultaneously creating more capacity for direct customer support functions at the MALS, such as expediting, technical research and (NAE) current readiness (CR)-related tasks. This re-alignment is consistent with management practices commonly found in state of the art supply chains in industry and is complementary to the tenants of Marine Aviation Logistics Support Program Modernization. **The Retail Supply Chain Modernization project** began in 2017, and it is on track for full implementation in CY2019.

CUSTOMER OPTIMIZED LEVELING TECHNIQUE AND PROACTIVE DEMAND LEVELING COLT/PDL

COLT minimizes customer wait time for a given level of investment by stocking more spares at the MALS for items which DLA cannot support and stocking fewer spares for items for which DLA is projecting strong support. COLT focuses on reducing customer wait time, but at the same time prioritizes parts that impact readiness.

PDL uses a set of business rules to process demand data from units with the same weapon system to proactively establish a stock level for an item with demands across the enterprise at a base that has not yet experienced demand for that item.



MARINE AVIATION LOGISTICS PLAN

AVIONICS

AIRCRAFT WIRING SYSTEMS INITIATIVE

Aircraft wiring systems continue to be a significant degrader of readiness throughout all T/M/S within the NAE. There is no fleet/enterprise standardization for aircraft wiring maintenance and repair, no advanced wire repair training for avionics personnel, and no familiarization training for non-avionics personnel.

NAVAIR wiring evaluations have uncovered numerous critical defects on what were believed to be full mission capable aircraft within all wings and across all T/M/S. Rectifying steps, such as the Advanced Wire Repair Course, are underway to correct deficiencies and train fleet personnel on proper procedures; however, a formal program that establishes training and maintenance standards for aircraft wiring systems does not exist.

In order to establish a healthy and effective maintenance base and to maintain gains we have realized through various initiatives such as CH-53 reset and advanced wire training, an Electronic Wiring Interconnect System (EWIS) program, which closely follows the FAA program of the same name, was implemented within the NAMP in FY18. The goal of the EWIS program is to standardize aircraft wiring system maintenance expectations, outline T&R requirements, aircraft wiring inspection criteria, and wiring system management requirements for all levels of maintenance throughout the Marine Corps as well as at depot and OEM-level activities.

FUTURE AUTOMATIC TEST EQUIPMENT SUPPORT

The Marine Corps currently utilizes the Reconfigurable Transportable Consolidated Automated Support System (RTCASS) family of testers to diagnose and repair legacy aircraft avionics components. The Navy is currently in the process of transitioning their Automatic Test Equipment to the eCASS family of testers at their shore sites and aboard CVN/L-Class ships. CVN conversion began in FY18 and L-Class conversion will begin in FY22. A full range of Operational Test Program Sets (OTPS) are being developed to support all of the Marine Corps' aircraft. ASL, in conjunction with PMA-260, is conducting a business case analysis to determine the best course of action with regards to future ATE support for legacy aircraft systems.

In order to support the emerging F-35 intermediate level maintenance requirement, the Marine Corps is scheduled to receive eCASS benches beginning in FY23. HQMC ASL is exploring opportunities to accelerate the timeline to match the first F-35 OTPS delivery in FY21.



MARINE AVIATION LOGISTICS

PLAN AVIATION ORDNANCE

The aviation ordnance community will optimize existing manpower, modernize our equipment and concepts of operation to become lighter, faster and more agile. We will accomplish these goals by focusing on three pillars: MOS alignment, resource management and advanced training.

To that end, we will continue to aggressively pursue these objectives through multiple initiatives, such as the advancement and normalization of shore-based and shipboard hot loading, simultaneous hot loading and hot refueling, optimization of ship-to-shore connectors to tactically transport all-up-round weapons, and replacement of antiquated Common Weapons Support Equipment and striking an improved balance between I-Level and O-Level training, tasking and responsibilities on the flight-line and on the battlefield. Specifically, we will attempt to empower O-Level squadron commanders with more inherent I-Level capability and cross train both I-Level and O-Level Marines across multiple TMS' at every available opportunity. Our aim is to tailor daily peacetime aviation ordnance operations to more closely reflect how we operate when supporting a WTI class, aggregate a MEU detachment or support disaggregated combat operations.

The final results of a recently completed CNA study will serve to further inform and influence this effort. These initiatives are specifically intended to expand the sphere of simultaneous aviation ordnance support operations, decrease aircraft turnaround time, increase sortie generation and improve lethality in support of the Ground Combat Element. In order to accomplish the above, we will continue to partner with resource sponsors and the Program Executive Office for Unmanned and Strike Weapons (PEOU and W) to best manage Operation and Maintenance, Navy (O and M,N) resources in order to best maintain and recertify the existing aviation weapon inventory.



The key to further solidifying our foundation is to foster a culture of learning and enabling an increased professional knowledge base for our aviation ordnance Marines. We will achieve this by taking full advantage of sound, comprehensive and targeted opportunities to participate in learning environments. We have recently sent aviation ordnance Marines to the Aviation Supply Short Course and the Joint Aviation Supply Maintenance Material Management course to determine value and applicability.

After complete evaluation, we will submit HPRR chits to mandate a percentage of the community attend these types of courses. We will align our new accession training to meet the evolving requirements of the 6500 MOS and the naval aviation enterprise. We are currently conducting a complete T&R review and the results of the review will inform future changes to both new accession and in-service training requirements for aviation ordnance Marines. Continuity of understanding will be further enhanced through refined Formal In-Service Training syllabi coupled with participation in the MAWTS-1 Expeditionary Aviation Ordnance Course (MEOC) and successful completion of the three newly revised levels of the Aviation Ordnance Managers Career Progression (AOMCP) course. In summary, we will continue to relentlessly identify, pursue and close gaps in the kill chain so that we can best ensure wholeness and maintain our critical role in the MAGTF's mission.

MARINE AVIATION LOGISTICS PLAN

Resource Management: As the operating environment continues to become more complex, our responses must be more creative and fiscally supportable than in past years. We must shed or re-purpose antiquated equipment, update policies and procedures, and minimize our logistics footprint while simultaneously improving our ability to generate power forward. Examples of this include working with the cargo lab and the Ordnance Information System (OIS) Program Office to develop and approve All Up Round (AUR) weapon tie down procedures applicable to MV-22, KC-130J, CH-53 and P-8, and field the shore-based OIS Partial Connect capability for ammunition accounting in the DAO environment. These capabilities, combined with the procurement of the new MHU-83 Weapons Loader, Self-Propelled Ordnance Transporter, Rough Terrain Ammunition Carrier and the re-purposing of select pieces of the legacy Single Hoist Ordnance Loading System (SHOLS) will ensure that we are successful in the future operating environment.



We will exploit every opportunity to modernize our force, develop and exploit All Up Round weapons transportation and resupply capabilities, and employ advanced logistics and IT solutions such as Ordnance Information System – Remote Partial Connect (OIS-RPC). Creative resource decisions, such as the replacement of the existing Short Airfield Tactical Site (SATS) air-launched weapons loader, pursuit of robotic technology to enable weapons movement in expeditionary environments, and the improvement of the legacy Single Hoist Ordnance Loading System (SHOLS), development of approved AUR weapon transport configurations, improved loading and fueling concepts, implementation of battery powered trucks for on base transport of AUR weapons will all serve to maximize our existing manpower and contribute to lighter, more mobile, responsive and flexible aviation ordnance support at both the tactical and operational level.

MARINE AVIATION LOGISTICS PLAN

OPLAN SUPPORT AND MAGTF LOGISTICS INTEGRATION

T-AVB

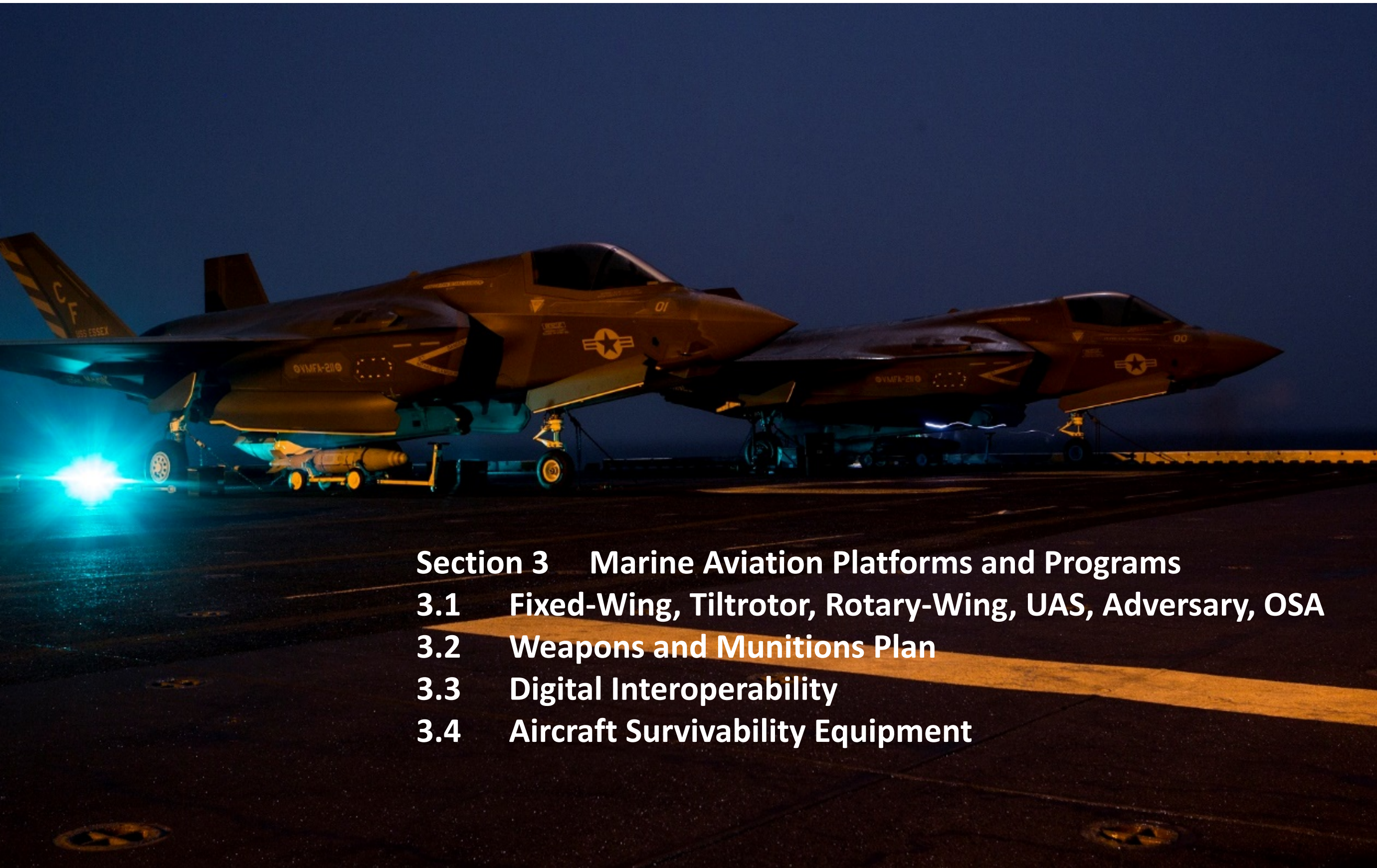
The T-AVB is a dedicated sea-based capability utilized for rapid movement and employment of USMC aviation I-Level maintenance facilities, supply support and personnel to sustain fixed- and rotary-wing aircraft operations. The recent certification of both T-AVB ship flight decks for MV-22 operations significantly enhances the ship's ability to support both primary and supplemental mission requirements. Additionally, new shipboard training requirements have been adopted that will help ensure that our Marines are working safely and effectively in this demanding environment.



MAGTF LOGISTICS INTEGRATION

The T-AVB will continue to be utilized during exercises representing present day and future engagements while continuing to validate future MAGTF requirements and increased support potential beyond ground and aviation logistics requirements. ASL and various stake holders are continuing to explore other avenues such as digital interoperability, ship-to-ship and ship-to-shore concepts of employment. Improvements and service life extensions will mean the T-AVBs remain a prominent part of AVLOG planning until 2030 when a replacement vessel is expected.

Aviation will continue efforts and partnership with the MAGTF Logistics Integration Charter, established as a formal venue to establish sharing of best practices between ground and aviation logisticians. Future efforts with the Deputy Commandant for Installations and Logistics include improved distribution methods and tracking, shared technology development efforts, and more integrated enterprise-level processes.



Section 3 Marine Aviation Platforms and Programs

3.1 Fixed-Wing, Tiltrotor, Rotary-Wing, UAS, Adversary, OSA

3.2 Weapons and Munitions Plan

3.3 Digital Interoperability

3.4 Aircraft Survivability Equipment

F-35B AND F-35C LIGHTNING II PLAN

MAGTF INTEGRATION

The F-35 will provide the MAGTF **strategic agility, operational flexibility and tactical supremacy.**

The F-35 was developed using a complete analysis of legacy aircraft shortfalls, emerging threats, and consideration of future operating locations. This approach led to an aircraft design that incorporates advanced stealth characteristics and a powerful sensor suite that provides superior awareness to the pilot and ensures increased survivability and lethality in all environments. This enables F-35 to shape the MAGTF fight.

The F-35 has an autonomous capability to strike a broad range of moving or fixed targets, day or night, in adverse weather conditions. These targets include air and ground threats, as well as enemy surface units at sea and anti-ship or land attack cruise missiles. The **F-35 can complete an entire kill chain** without reliance on external sources by using fused information from its onboard systems and/or other F-35s. This capability allows shortened engagement times, lower exposure to threats, and enables the aircraft to retain the element of surprise.

Together these elements allow the pilot to control the tactical environment using preemptive tactics. The F-35 provides sensor data to MAGTF command and control agencies to enable intelligence collection and targeting across the force. It unites 5th generation stealth, precision weapons and multi-spectral sensors with the expeditionary responsiveness of a Short Take-off and Vertical Landing (STOVL) fighter-attack platform. The F-35C provides critical flexibility and persistence operating from conventional aircraft carriers or land bases.

The US Marine Corps is procuring both the F-35B and F-35C variants to replace our aging AV-8B and F/A-18 fourth-generation aircraft and our now-retired EA-6B electronic warfare workhorse. This aircraft will enable the Marine Corps to meet steady-state and contingency requirements.

MISSION STATEMENT

The F-35's mission is to attack and destroy surface targets, intercept and destroy enemy aircraft, provide electronic warfare support, and network enabled reconnaissance support across the full spectrum of combat operations.



F-35B AND F-35C LIGHTNING II PLAN

CAPABILITIES (F-35B / F-35C)

Aircraft Specifications

- Empty Weight: F-35B = 32,472 pounds; F-35C = 34,581 pounds
- Max Gross Weight: F-35B ~60,000 pounds; F-35C ~ 70,000 pounds
- Internal Fuel: F-35B = 13,400 pounds; F-35C = 19,624 pounds
- Speed (Cruise w/ Attack Payload): .94M / Top speed: 1.6M
- Combat Radius:
 - F-35B = 450 nm; F-35C = 600 nm

Configuration

- Low observable
- Weapons stations internal:
 - F-35B 2 x 1,000 pound class + 2 x AIM-120 AMRAAM
 - F-35C 2 x 2,000 pound class + 2 x AIM-120 AMRAAM
- Armament: AIM9X, AIM-120, 25mm Gun, LASER guided weapons, GPS guided weapons, dual mode weapons
- Sensors: APG-81 radar, Electro Optical Targeting System (EOTS), 360° integrated fused sensor information
- Networked Systems: Link 16, VMF, Multi-function Advanced Data Link (MADL)
- ASE: Advanced Electronic Warfare / Electronic Protection (EW/EP), electro-optical Distributed Aperture System (DAS) that includes SAM launch reporting, missile warning and an advanced Infrared Search and Track System (IRST)



Notional Mission Profiles

- Attack (OAS)
 - Combination of air-to-air weapons and air-to-surface weapons (DAS)
 - Air-to-surface Weapons; with capability for auxiliary mission equipment with external pylons in Block 3F (CAS)
- Fighter (AAW)
 - Combination of air-to-air weapons and air-to-surface (OAAW)
 - Pure air-to-air loadout combined with lethal sensors, systems, and low observability
- ISR
 - Weapon lethality as required
 - Integrated sensors and data link networks

F-35B AND F-35C LIGHTNING II PLAN

ORGANIZATION

The F-35B and F-35C will replace the F/A-18, AV-8B, and EA-6B. The Marine Corps will procure a total of 420 F-35s (353 F-35Bs and 67 F-35Cs) in the following squadron configurations:

- 1) 9 Squadrons x 16 F-35B
- 2) 5 Squadrons x 10 F-35B
- 3) 4 Squadrons x 10 F-35C
- 4) 2 Squadrons x 10 F-35B reserve
- 5) 2 Squadrons x 25 F-35B Fleet Readiness Squadron (FRS)

Total F-35 procured at end of FY19: 135 F-35B; 23 F-35C

The aircraft reached its full program-of-record operational capability (Block 3F) late in calendar year 2018. The full transition from legacy to F-35 will complete with the transition of the second reserve squadron in 2031.

With a mixture of 10 and 16 plane F-35B squadrons, the current transition plan allows MAGTF commanders the flexibility to deploy a 6-plane MEU detachment all the way up to a full 16-plane squadron. Our F-35Cs will be able to deploy operationally with the Carrier Air Wing in support of Carrier Strike Groups in the early 2020s as well as to deploy in support of MAGTF commanders as a 10-plane squadron.

VMFA-121 has been providing enduring support to the 31st MEU. Support has endured CERTEX evaluations, Ssang Yong 2018, incorporation of distributed STOVL operations conducted in South Korea, and myriad of at-sea periods throughout the year.

VMFA-211 completed the first traditional F-35 workup cycle and full deployment with the 13th MEU/ARG team. They have completed that deployment, supporting operations in CENTCOM and PACAOR including combat sorties w/weapons engagements. The det flew almost 2000 hours, with 1200 of those in more than 750 combat sorties. Fifth generation capabilities and advanced EW, ES, and EA continue to redefine and enhance the MAGTFs and amphibious task forces.

VMFA-122 transitions from an East Coast F/A-18 squadron to a West Coast F-35B squadron. They continue to grow toward full PAA, and support CONUS-based training requirements.

In 2019 the Marine Corps will start to transition its first F-35C squadron. VMFA-314, currently an F/A-18 squadron located in Miramar, will be re-designated an F-35C squadron and remain in Miramar. The squadron is expected to train at a pace that will put them at a T2 rating by the middle of FY 2021, prepared to deploy in support of a CVN TAI deployment in early 2022.

VMFAT-502 will stand up ahead of VMFA-225 with an anticipated safe for flight date in the last half of FY20. It will be the second USMC F-35B FRS and help meet the USMC F-35B transition pilot training requirements. VMFA-225 will sundown legacy F/A-18D operations in order to recapitalize structure and manpower to help VMFAT-502's stand up and then transition to F-35B at MCAS Yuma, AZ; this will ultimately consolidate 2x USMC F-35C squadrons at Miramar (VMFA-314 and VMFA-311) by FY22.

In order to support transitions to F-35C, the Marine Corps will have procured 23 F-35Cs at the end of FY19, and will continue to deliver to the joint Navy/Marine Corps F-35C FRSs and our first USMC F-35C squadron. The USMC is currently contributing F-35C aircraft, instructor pilots and maintainers to USN F-35C FRSs.

F-35B AND F-35C LIGHTNING II PLAN

MANPOWER

AVIATOR STAFFING

Maximum production of fleet capable F-35 pilots is critical to the success of the USMC TACAIR transition. CAT I production continues to be the main effort for the FRS with increasing CAT I pilot training requirements (PTR) expected each year from VMFATs-501 and -502. FY20 through FY22 are critical years for F-35B pilot production to support transitions and to sustain the established F-35B squadrons during their operational deployments. In addition to the standup of VMFAT-502 and the Navy's F-35 FRS in this period, Marine CAT I PTR will grow to meet our increasing requirements.



In addition to CAT I pilots, CAT II Transition/Conversion pilot requirements are critical to building TACAIR experience in the F-35 fleet and balancing pilot inventories. Per MARADMIN 134/18, opportunities will expand as the selection process is streamlined and be more responsive to the FRS training timeline and the legacy TACAIR sundown. As FRS pilot production factors stabilize and create a more steady timeline, the goal is to identify school seats and pilots to fill them beyond just the next FY. The goal is a more predictive program allowing legacy TACAIR communities to plan their career paths with more refinement.

ENLISTED STAFFING

F-35 aircraft requirements continue to evolve as the platform matures. A low-observability work center has been added and requisite manpower structure begins arriving this year. Additional intermediate level maintenance structure has been added in order to support future growth at that level of repair. As the intermediate level maintenance requirement continues to evolve, HQMC will capitalize on opportunities to add enlisted maintenance personnel in order to increase aircraft readiness.

F-35B AND F-35C LIGHTNING II PLAN

SUSTAINMENT

Reliability and Maintainability Improvement Projects (RMIP) continue to produce significant benefits for sustainment initiatives. The RMIP process pulls driver analyses from multiple sources to initiate candidates for investigation. The program retains a database, collecting relevant data used to prioritize projects. The RMIP recommends funding “Top 5” projects pulled from prioritization process to yield measured improvements in readiness.

An F-35 Level Of Repair Analysis (LORA) has been completed and resulted in identification of components that are candidates for intermediate level repair. The goal of intermediate level support is twofold: 1) provide cost effective maintenance support and 2) increase aircraft readiness. The timeframe for implementation of a USMC I-Level Capability requires a phased approach due to availability of requisite component test stations and the development unique F-35 maintenance procedures. The Marine Corps is already reaping the benefits of limited I-Level repair and the capability will continue to grow to 2023 and beyond.

A **core concept of the F-35 program for supply is to share spares assets across military services and partner nations** as part of the Global Spares Pool. The result of this approach is lower quantity and cost of overall spares than if individual services and partner nations procured spares separately. The Marine Corps and all partners in the F-35 program continue to improve the model in order to provide higher levels of readiness at a potential cost reduction.

One focus of effort continues to be the refinement of training requirements, process improvement, and system understanding of the sophisticated avionics in this airframe. The complexity of the F-35 requires avionics technicians to be well versed in a multitude of

maintenance disciplines. Training will cover the full spectrum of requirements from fiber optics cleaning and repair procedures to training in the analysis of maintenance data from the aircraft to improve fault isolation. Improved troubleshooting will be enabled by the availability of advanced test sets that will provide real-time data streaming; a key to effectively troubleshooting the complex electronic warfare suite of the aircraft.

RESERVE INTEGRATION

The transition of VMFA-112 and the stand up and recapitalization of VMFA-134 to the F-35 will remain a critical part of the TACAIR roadmap and the reserve component’s ability to augment, reinforce, and sustain the active component. In preparation for this transition, a reserve squadron augment unit (SAU) has been established at VMFAT-501 and currently supports F-35 FRS flight operations.



F-35B AND F-35C LIGHTNING II PLAN

CURRENT FORCE PAA:

5 AC VMFA SQDN x 12 F/A-18 A++/C
 4 AC VMFA(AW) SQDN x 12F/A-18D
 2 AC VMFA SQDN x 16 F-35B
 1 RC VMFA SQDN x 12 F/A-18A++
 5 AC VMA SQDN x 16 AV-8B
 1 FRS x 26 AV-8B/TAV-8B , 1 FRS x 41 F/A-18A/B/C/D, 1 FRS x 25 F-35B

FORCE GOAL PAA:







9 AC VMFA SQDN x 16 F-35B
 5 AC VMFA SQDN x 10 F-35B
 4 AC VMFA SQDN x 10 F-35C
 2 RC VMFA SQDN x 10 F-35B
 *2 FRS SQDN x 25 F-35B

	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	
VMFAT-501	25B		Beaufort																			
VMFA-121	16B		Yuma	Japan																		
VMFA-211			Yuma	16B	Yuma																	
VMFA-122			Beaufort		6B → 16B	Yuma																
VMFA-314				Miramar	6C → 10C	Miramar																
VMFAT-502**						6B → 16/25B	Beaufort	Miramar														
VMFA-225*					Miramar		6B → 10/16B	Yuma														
VMFA-242*						Japan		6B → 16B	Japan													
VMA-311*						Yuma		6C → 10C	Miramar													
VMA-214*						Yuma		6B → 16B	Yuma													
VMA-542*							Cherry Point	6B → 16B	Cherry Point													
VMFA-115*							Beaufort	6C → 10C	Cherry Point													
VMFA-533*								Beaufort	6B 10B	Beaufort												
VMFA-251*								Beaufort	6C → 10C	Cherry Point												
VMFA-224*								Beaufort	6B → 16B	Beaufort												
VMA-231*								Cherry Point	6B → 16B	Cherry Point												
VMA-223*								FY22: AV-8B FRD	Cherry Point	6B → 10B	Cherry Point											
VMFA-312*									Beaufort	6B → 10B	Cherry Point											
VMFA-232*										Miramar	6B → 10B	Miramar										
VMFA-323*									FY24: F/A-18 FRD	Miramar	6B → 10B	Miramar										
VMFA-112* (RES)											Ft Worth	6B → 10B	Beaufort									
VMFA-134* (RES)												6B → 10B	Miramar									

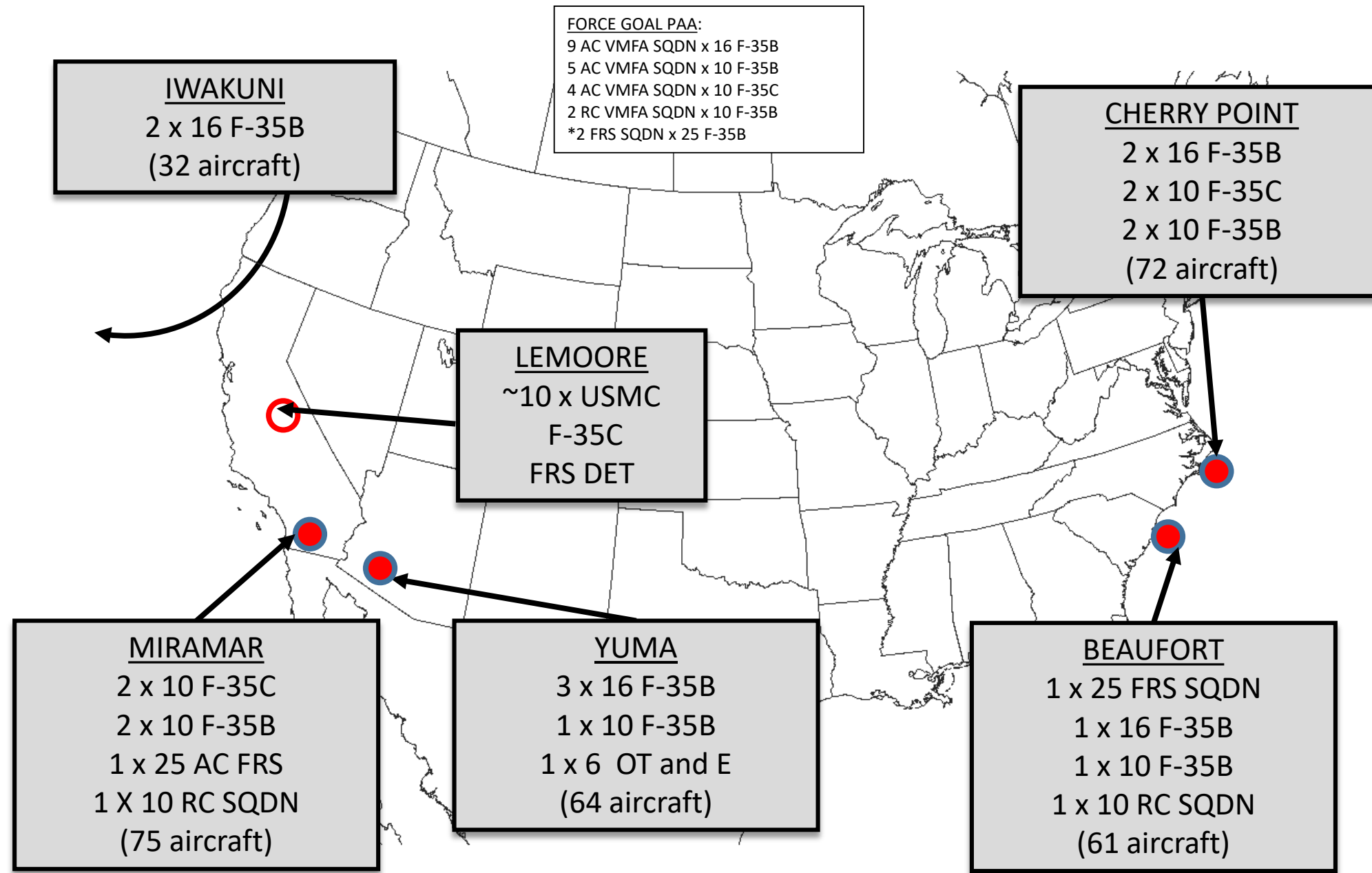
Transition sequence meets current global commitments, optimizes deployment to dwell, and maximizes available combat aircraft in support of Marines.

AV-8B FRD will stand up FY22
 F/A-18 FRD will stand up FY24

*Manpower structure, MOS production, and inventory available will inform individual unit transition timelines and the aircraft assigned.
 **PAA build to 25 a/c and potential relocation will be assessed in the future to determine optimal year of execution.

	Left side signifies the T/O change to JSF and the start of transition.		16B	Depicts growth from 6 a/c (SFF) on left side and the plan for unit final PAA.
	Right side is planned squadron safe-for-flight (SFF) with 6 a/c, and is event driven.		10B	Right side depicts planned FOC and PAA, but remains event driven.
	Indicates extended transition in C5 status without legacy operations.		10C	Transition Task Force will determine the optimal timelines by unit. F-35C FRS flight ops at VFA-125 at NAS Lemoore.

F-35 LIGHTNING II (VMFA) PLAN



F-35B AND F-35C LIGHTNING II PLAN

INITIATIVES AND WAY AHEAD

The F-35 is the future of all TACAIR for the Marine Corps. Our TACAIR evolution over the next five years will focus on:

- Detachment and deployment capability for all VMFAs (manpower, equipment, training, mobile facilities);
- Military construction across the Marine Corps to include upgrades to facilities and sustainability for the growing fleet;
- Aircraft survivability equipment upgrades; and
- The Continuous Capability Development and Delivery (C2D2) modernization plan.

Research, Development, Test and Evaluation (RDT and E) is fully integrated into the procurement of all F-35 variants.

Highlights in current and future technologies include:

Block 2B/3i: Initial Operating Capability (**July 2015**)

Weapons:

All weapons internal only
2 x AIM-120C and
2 x 1000lb JDAM (GBU-32) or 2 x 500lb LGB (GBU-12)

Sensors/Capabilities:

- High Resolution Synthetic Aperture Radar (SAR) mapping
- All-weather targeting
- Laser Designator combined with Electro Optical Tracker System (EOTS) (Built in Targeting Pod)
- Radar Electronic Attack (EA)

Weapons:

Internal weapons from Block 2B/3i + external weapons up to 4x500lb class weapons on wing stations, gun pod, AIM-9X, 2000lb class capability (F-35C)

Sensors/Capabilities:

- Sensor and datalink capability expanded
- Send and receive still images via L16 and VMF/Strikelink suite.
- Automatic target recognition
- Ground Moving Target Tracker (GMTT)
- CVN operations
- Interim Full Motion Video (FMV)
- GBU-49 carriage / release

Block 4: Follow on development (**2019-Future**)

Weapons:

Expansion of weapons to include moving target capable weapons, Small Diameter Bomb (SDB-II), Net Enabled Weapon, JSOW C-1 Net Enabled Weapon (F-35C), AIM-9X Blk II

Sensors/Capabilities:

- Maritime radar modes
- Expansion of combat ID capabilities
- Interoperability capabilities
- Passive targeting/employment capabilities
- Offensive electronic attack and electronic protection capabilities
- Streaming video
- Resolution upgrade
- Full Motion Video (FMV)

F-35B AND F-35C LIGHTNING II PLAN

DEVELOPMENTAL TEST :

Continuous Capability Development and Delivery (C2D2)

OPERATIONAL TEST AND EVALUATION : Ongoing efforts include:

Official Initial Operational Test and Evaluation (IOT and E)

Defensive weapon system envelope expansion

Digital Interoperability (DI)

Integrated Aircraft Survivability Equipment (ASE)



F/A-18A-D HORNET (VMFA) PLAN

VALUE TO THE MAGTF

The F/A-18A-D Hornet will see a major upgrade with the recent decision to upgrade the radar to AESA technology. The acquisition currently is in development and integration test with the APG-79v4. Coupled with its complement of advanced precision-guided weapons, advanced LITENING targeting pod, network interoperability, and beyond visual range air-to-air missiles the Hornet provides relevant and lethal capability to the MAGTF and combatant commanders.

F/A-18s are, and will remain, the primary bridging platform to F-35B/C, with a planned sunset of 2030. VMFA(AW)-225 will shut down early, enabling structure to stand up VMFAT-502 aboard MCAS Beaufort. VMFA(AW)-242's timeline has moved forward in the transition plan, transitioning in place to a F-35B squadron and aligning Marine TACAIR with the NDS.



The F/A-18A-D community continues combat operations for the seventeenth straight year with Hornets in support of Operation INHERENT RESOLVE. Our aircraft are land-based with MAG-12, and shipboard on aircraft carrier deployments as part of our TACAIR Integration (TAI) commitment. The USMC fleet will have nine active squadrons and one reserve squadron by the end of 2019. VMFA-314 will begin its transition in 2019 to become the first USMC F-35C TAI squadron.

As transition to the F-35 continues, VMFAT-101 will sundown in FY23 as VMFA-323 will assume aircrew training responsibilities through FY29.

MISSION STATEMENT

The F/A-18A-D Hornet supports the MAGTF commander by providing supporting arms coordination, conducting multi-sensor imagery reconnaissance, and destroying surface targets and enemy aircraft, day or night, under all weather conditions, during expeditionary, joint, or combined operations.

CAPABILITIES

Aircraft Specifications

- Empty Weight: 24,000 – 25,000 pounds
- Max Gross Weight: 51,900 pounds
- Useful Payload: 11,000 pounds
- Speed (Cruise/Max): 0.78M – 0.85M / MACH 1.8

Configuration

- Weapons Stations: Nine
- Armament Air – Air: AIM-9, AIM-7, AIM-120, 20mm Gun Air-Surface: 20mm Gun, Rockets, GP Bombs, Laser Guided Weapons, GPS guided weapons, Dual mode weapons, HARM/AARGM
- Sensors: APG-65/73 RADAR, AN/AAQ-28 LITENING Pod Gen 4, Advanced Tactical Air Reconnaissance System (ATARS on F/A-18D only)
- Networked Systems: LINK 16, LITENING ROVER downlink
- ASE: ALE-39/47, ALQ-126B and 214v5, ASPJ-165, ALR-67v2 and 3

Notional Mission Profile (OAS)

- Range/Time on Station (TOS)- 200nm transit, 1+00 TOS, 200nm RTB
- Loadout- (2) GBU-38, (2) GBU-54, (2) AIM-9X, (2) AIM-120, (578) 20mm

F/A-18A-D HORNET (VMFA) PLAN

ORGANIZATION

F/A-18A-D squadrons are assigned to MAG-31 at MCAS Beaufort, SC, MAG-11 at MCAS Miramar, CA, MAG-12 at MCAS Iwakuni, JP, and MAG-41 at JRB Fort Worth, TX :

- 1) MAG-31: (1) F/A-18A++/C (2) F/A-18C (2) F/A-18D
- 2) MAG-11: (2) F/A-18C (1) F/A-18D (1) FRS
- 3) MAG-12: (1) F/A-18D
- 4) MAG-41: (1) F/A-18A++/C+ (reserves)

TAI: Currently the Marine Corps has one TAI squadron allocated to USN CVWs. The Navy and Marine Corps will increase TAI levels to four with the F-35C. The Marine Corps is committed to TAI and the F-35C program. VMFA-314 will become our first F-35C squadron, transitioning in FY19; and will execute the first USMC F-35C deployment in FY22.

FRS

In order to bridge transition to F-35 from legacy fighter/attack aircraft, Marine aviation is beginning an early sundown of VMFAT-101, as VMFA-323 becomes an FRD. The -323 mission will be to train CAT I through IV aircrew until the sundown of the Hornet. As VMFA-314 enters its transition to an F-35C squadron, they will begin to train CAT 3/4 aircrew, which will allow VMFAT-101 to focus on CAT I production.



F/A-18A-D HORNET (VMFA) PLAN

MANPOWER

HQMC Aviation ensures the force structure requirement is accurate in order to provide the correct demand signal to planners and assignments monitors at Manpower and Reserve Affairs. The F/A-18 cell continues to analyze Hornet manpower requirements as the aircraft ages and approaches sundown. When appropriate and feasible, contract maintenance support (CMS) will be used to mitigate flight line maintenance manpower and experience shortfalls. The key to sustaining the F/A-18 pilot inventory is healthy FRS production and continuous integration with MMOA. Efforts are underway to improve training throughput at VMFAT-101.

SUSTAINMENT

As an out-of-production aircraft, the F/A-18A-D program is focused on addressing inventory management, readiness degraders, solving chronic material shortfalls, and closing the Mission Capable(MC) gap.

High operational tempo, coupled with increased maintenance requirements at the squadron level further degrades readiness and is a focus of F/A-18A-D program initiatives.

A strategic BUNO-by-BUNO review of the F/A-18A-D total active inventory is consistently being conducted by the naval aviation enterprise. As a result of USN legacy divestment at the end of 2019, all USMC fleet squadrons will transition to Lot 15 and above aircraft of a similar configuration, “Best of Breed.” The overall increase in the USMC F/A-18 inventory will help to further mitigate material shortfalls. Possible F/A-18C divestment in partner nations in the 2020 timeframe may provide additional opportunities to strengthen the USMC aircraft inventory.

The F/A-18A-D team is actively engaged in inventory management, multiple readiness initiatives, planning an aggressive strike/store plan, and implementing re-engineered end of life PMI events. This review will identify “best of breed” aircraft for the fleet, and ensure the success of the USMC transition plan through 2030. Part of this plan also includes establishing a Level 3 flight line preservation facility aboard MCAS Miramar along with MALS becoming an aircraft custodian. This will reduce the squadron level burden concurrently providing flexibility and cost savings while effectively managing the Hornet inventory through sundown.



Leadership continues to conduct executive level engagement with DOD agencies supporting the F/A-18A-D, as well as with key vendors and OEMs. For the second time in five years, the executive leaders participated an Executive Steering Summit (ESS) addressing key readiness issues amongst the F/A-18A-D community. Additionally, an independent readiness review recently completed identifying further actions that can be taken to increase supply responsiveness and increase mission capable rates.

F/A-18A-D HORNET (VMFA) PLAN

Readiness is directly affected by NMCS and NMCM degraders:

- **The supply system is not able to keep pace** with material demands (NMCS)
- The **quality of maintenance training curricula, maturation, and standardization** has not kept pace with readiness requirements (NMCM)
- Current **maintenance manning levels are unable to support demands for labor** (NMCM). It is essential that this void be filled with contract maintenance support (CMS) to make a positive impact on readiness.

The F/A-18 Service Life Management Program (SLMP) consists of the Center Barrel Replacement Plus (CBR+) and High Flight Hour (HFH) inspection programs. The CBR+ has extended the service life of numerous Lot 17 and below aircraft and the HFH inspection has extended the life of the F/A-18A-D aircraft beyond 8000 hours.

In parallel with HFH and CBR+ maintenance, the Service Life Extension Program (SLEP) incorporates a combination of inspections, repairs and a number of Engineering Change Proposals to extend additional F/A-18 A/C/D to 10,000 Flight Hours.

The Naval Aviation Enterprise has re-engineered the post-8000 hour end of life maintenance plan. Developing a combined HFH/PMI-X depot event has created significant depot level maintenance man hours savings which can be reallocated to SLEP MOD incorporation and other O-Level “over and above”, while simultaneously relieving the squadron level maintenance department of inspection requirements.

RESERVE INTEGRATION

VMFA-112 is the Marine Corps operational reserve squadron. This squadron will support total force TACAIR requirements until it transitions to the F-35 in the FY2030 timeframe. At that time and per TACAIR transition plan, VMFA-112 will relocate to MCAS Beaufort.



CURRENT FORCE PAA:
 5 AC VMFA SQDN x 12 F/A-18 A++/C
 4 AC VMFA(AW) SQDN x 12 F/A-18D
 1 RC VMFA SQDN x 12 F/A-18A++
 1 FRS x 41 F/A-18A/B/C/D

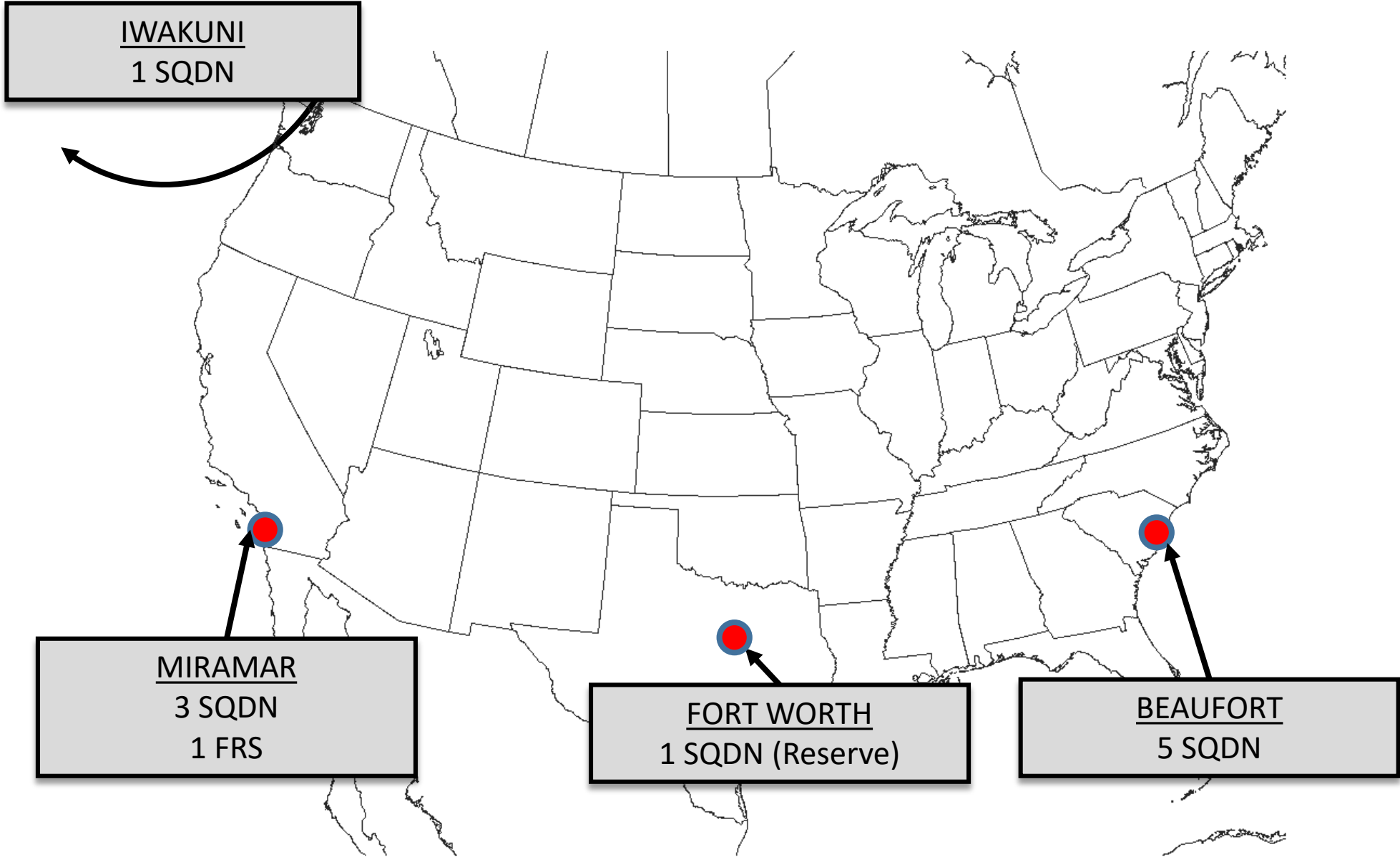
F/A-18A-D HORNET (VFMA) PLAN

FORCE GOAL F-35 PAA:
 9 AC VMFA SQDN x 16 F-35B
 5 AC VMFA SQDN x 10 F-35B
 4 AC VMFA SQDN x 10 F-35C
 2 RC VMFA SQDN x 10 F-35B
 2 FRS SQDN x 25 F-35B

		FY19				FY20				FY21				FY22				FY23				FY24				FY25				FY26				FY27					
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4		
MAG-31 Beaufort																																							
VMFA-115	12 F/A-18A++/C																	C	V					F-35C Squadron															
VMFA(AW)-533	12 F/A-18D																			B	V			F-35B Squadron															
VMFA-251	12 F/A-18C																			C	V			F-35C Squadron															
VMFA(AW)-224	12 F/A-18D																				B	V		F-35B															
VMFA-312	12 F/A-18C																															B	V						
	4 F/A-18 C/D TOFT																																						
MAG-11 Miramar																																							
VMFA-314	12 F/A-18A++									C	V			F-35C Squadron																									
VMFA(AW)-225	12 F/A-18D											C5	B	V	F-35B Squadron																								
VMFA-232	12 F/A-18C																																						
VMFA-323	12 F/A-18C																							Squadron becomes FRD															
VMFAT-101	41 F/A-18A-D																							Sundown															
	6 F/A-18 C/D TOFT																																						
MAG-12 Iwakuni																																							
VMFA(AW)-242	12 F/A-18D													B	V			F-35B Squadron																					
	3 F/A-18 C/D TOFT																																						
	1 F/A-18 SimiStrike																																						
MAG-41 Fort Worth																																							
VMFA-112	12 F/A-18A++/C+																																						
	F/A-18 C TOFT																																						
	3 F/A-18 SimiStrike																																						

B = F-35B TRANSITION BEGINS
 C = F-35C TRANSITION BEGINS
 V = FOC

F/A-18A-D HORNET (VMFA) PLAN



F/A-18A-D HORNET (VMFA) PLAN

INITIATIVES AND WAY AHEAD

With sundown on the horizon, the F/A-18A-D is nearing the final fit for adding capabilities.

- 1) Avionics and software upgrades (AESA, LINK-16, RNP/RNAV, Mode 5/S, ADS-B out)
- 2) Weapons modernization (AIM-9X Block II, AIM-120D, APKWS, JSOW, Net Enabled Weapons)
- 3) Digital interoperability (LITENING ATDL, high definition video wireless to the cockpit, VMF, BLOS communication)
- 4) Increased survivability (IDECM upgrade, Automatic Ground Collision Avoidance System (AGCAS), NAVWAR)
- 5) Readiness (DRI, PRE/PRL, AI-684 / PMI 1X/2X, Contract Maintenance Support for O-Level)



RECENT UPGRADES

RNP/RNAV (GPS approach) – 2018
Mode 5 / Mode S – 2019
ADS-B (Out) – 2020

LETHALITY

AESA upgrade (APG-79 v4) 2021
AIM-9X Block II – 2018
AIM-120D – 2016
APKWS – 2018

SURVIVABILITY

ALR-67 v3 – 2018 , v5 2023
ALQ-214 v5 - 2018

INTEROPERABILITY

LINK-16 – MIDS JTRS (CMN-4)- 2018
LITENING pod Gen 4

RELIABILITY

Solid-state recorders – 2016

AV-8B HARRIER (VMA) PLAN

VALUE TO THE MAGTF

The AV-8B Harrier, with its complement of advanced precision-guided weapons, advanced LITENING targeting pod, and beyond visual range air-to-air missiles provides relevant and lethal capability to the Marine Corps. As a vertical/short takeoff and landing (VSTOL) aircraft, the AV-8B provides TACAIR basing flexibility to the MAGTF; the Harrier has been and continues to be the premier TACAIR platform aboard the MEU. As the Harrier transitions out of the Fleet Marine Force, its amphibious VSTOL role will be filled by the STOVL F-35B.

AV-8B squadrons and detachments continue to execute deployed operations on MEUs and in support of Operation INHERENT RESOLVE. As an enduring mission they **maintain 12 aircraft deployed on MEUs with 12 in workup, and support a 10 or 12-aircraft deployment for SPMAGTF tasking annually, alternating with F/A-18.**

The AV-8B's lethality and VSTOL capability, combined with the ARG's proximity to littoral targets, rapid turnaround time, and hot reloading of weapons, provide unique capability to the deployed MEU.

MISSION STATEMENT

The AV-8B Harrier supports the MAGTF commander by destroying surface targets and escorting friendly aircraft, day or night, under all weather conditions, during expeditionary, joint, or combined operations.

CAPABILITIES

Aircraft Specifications

- Empty weight: 14,912 pounds
- Max gross weight: 32,000 pounds
- Usable payload: ~ 17,000 pounds
- Speed (cruise/max): 360 kts / 585 kts

Configuration

- Weapons Stations: Seven (4 pylons Digital ITER capable)
- Armament: 500 and 1000 pound JDAM/LJDAM, laser guided, and general purpose bombs; CBU-99/100; CBU-78; MK-77; 2.75" and 5.0" rockets; Advanced Precision Kill Weapon System (APKWS); AGM-65E/E2; AIM-120B; AIM-9M; GAU-12 25mm gun
- Sensors: APG-65 RADAR, AN/AAQ-28 LITENING Pod Gen 4, Integrated NAVFLIR, Dual-Mode Tracker
- Network Systems: Automatic Target Handoff System/VMF (digitally aided CAS), LITENING C-band video downlink, **LINK-16**
- ASE/EW: ALE-47 ECM, ALR-67v2 RWR, ALQ-164 DECM Pod, Intrepid Tiger II

Notional Mission Profile

- OAS
 - Range/Time on Station (TOS)- 200nm transit, 1+00 TOS, 200nm RTB
 - Loadout- (3) 500# PGM (JDAM/LGB), (7) 2.75" APKWS rockets, External Fuel Tanks, LITENING POD

AV-8B HARRIER (VMA) PLAN

ORGANIZATION

Marine Corps AV-8B squadrons function as an integral unit or as a squadron (-) with a deployed six aircraft detachment. This concept **facilitates dual site operations, provides for the support of simultaneous contingencies, and allows for the fulfillment of continuous unit deployment program requirements.** The USMC maintains five active operational squadrons comprised of 16 AV-8B aircraft each and an FRS comprised of AV-8B and TAV-8B aircraft.

The Marine Corps will maintain five operational squadrons until FY22. West Coast VMAs complete transition to F-35 in FY23; the East Coast maintains operations until FY28.

FRS

VMAT-203, the FRS, will train pilots until FY22 when it will transition to an FRD under VMA-223.

The FRD will conduct limited CAT I production and CAT III, IV, and V training. Detailed planning for the construct and placement of the FRD is in work to ensure operational commitments and FRD production are supported.



AV-8B HARRIER (VMA) PLAN

MANPOWER

VMA structure requirements remain constant until FY21, when Harrier-related MOS requirements decrease with the sundown of VMAT-203. Officer and enlisted initial accession training will continue but at reduced numbers until the final years of the AV-8B. Lateral moves into F-35 related MOSs will be considered on a case by case basis in accordance with the TACAIR transition policy letter and will be balanced against VMA manpower requirements.

SUSTAINMENT

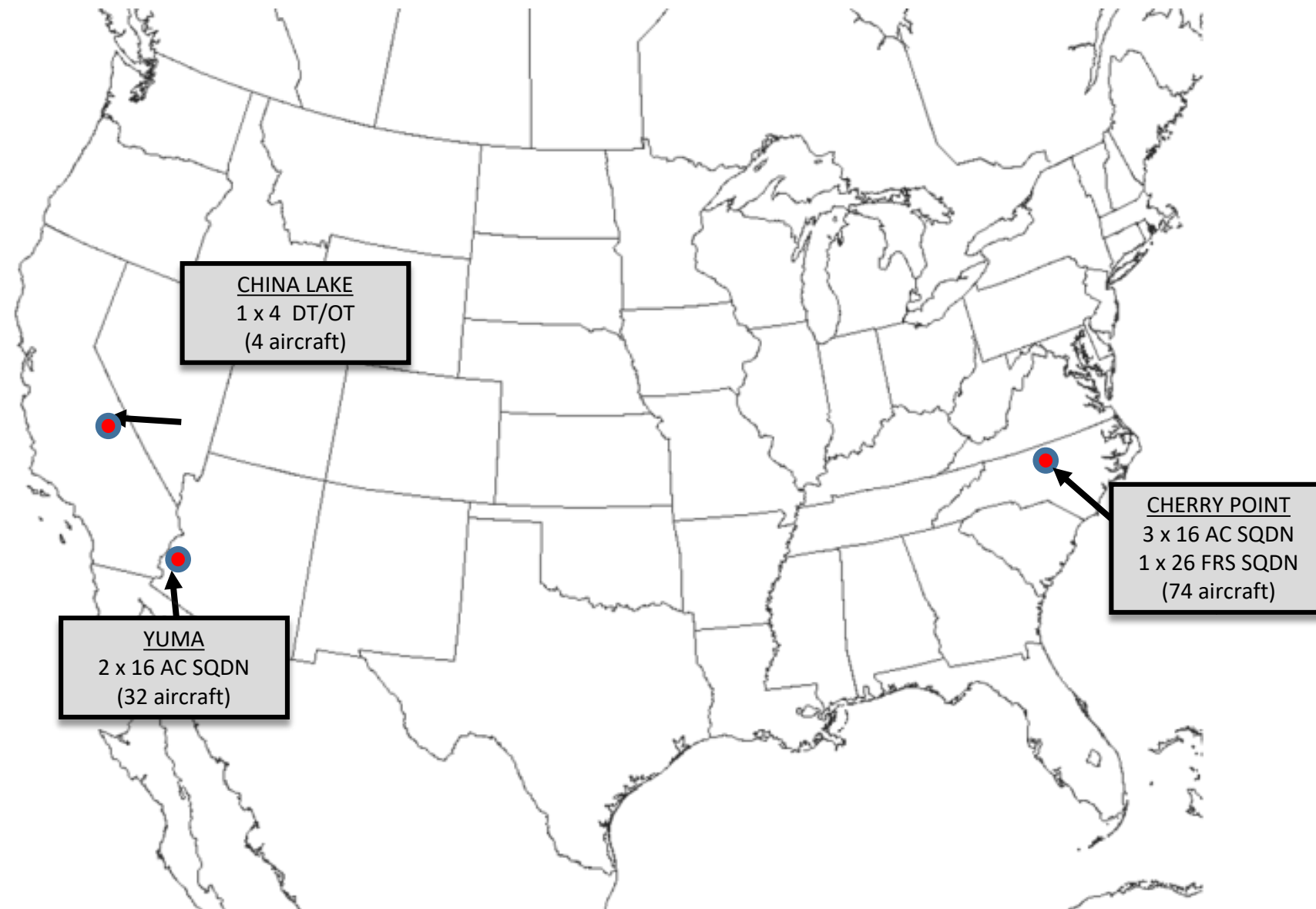
The current AV-8B active inventory consists of 124 aircraft. There are 16 TAV-8B training aircraft, 34 night attack aircraft, and 74 radar aircraft. The AV-8B fleet is currently fulfilling, with five squadrons, the operational commitments previously filled by seven squadrons.

We have seen an increase in readiness across the fleet. We continue to address our RBA degraders through the engagement of the program office, TMS lead (MAG-14 commanding officer), and HQMC. Lessons learned, and process improvements from, the independent readiness review continue to drive the method the AV-8B program is using to sustain the fleet.

Sustainment of the AV-8B program is focused on **maintaining readiness through the end of service**. Airframe fatigue life and flightline inventory are not a current problem, and are not forecast to be through the transition to F-35.



AV-8B HARRIER (VMA) PLAN



AV-8B HARRIER (VMA) PLAN

INITIATIVES AND WAY AHEAD

The AV-8B Harrier has long been the Marine Corps' only fixed-wing TACAIR on MEUs; now, with the advent of F-35B deployed with the MEU, Harrier is sharing the MEU TACAIR mission. As a strike, long-range escort, and air defense asset of the MEU ACE, the AV-8B must continue to develop and address future capability gaps that will allow it to conduct its METS until sundown.

This evolution over the next five years will focus on:

- 1) Avionics and software upgrades (LINK-16, RNP/RNAV, Mode 5/S, ADS-B out, Helmet Mounted Cueing System, upgraded survivability equipment)
- 2) Weapons modernization (AIM-9X Block II, AIM-120C, APKWS warhead and envelope expansion, precision stand off weapons)
- 3) Digital interoperability (LITENING ATDL, high definition video wireless to the cockpit, VMF, SATCOM)
- 4) Readiness (PRE/PRL, F402 engine safety/reliability, FOD programs)

H7.0 OFP

H7.0 is scheduled for release in FY20 and brings additional weapons capabilities to the AV-8B. APKWS integration improvements and JSOW integration are incorporated into H7.0, as well as a number of software improvements.

H7.0 is a software-only OFP and does not require modification of the aircraft.

H7.1 OFP

H7.1 is scheduled for release in FY21 and brings enhanced avionics and weapons capabilities to the AV-8B. Full LINK-16 integration will be completed in all AV-8B II + Radar aircraft; this expands on LINK-16 message sets included in H6.2 (FY18) and includes fighter-to-fighter messages. Additionally, AIM-9X Block II will also be integrated onto the AV-8B, as well as ADS-B out (FAA signaling, the precursor to TCAS), and full Mode 5/S.

H7.1 is a software-only OFP and does not require modification of the aircraft.

LITENING ADVANCED TACTICAL DATA LINK

LITENING Advanced Tactical Data Link (ATDL) is the next step for USMC LITENING and will be integrated on AV-8B and F/A-18 aircraft. ATDL expands on the capabilities of the current Gen 4 LITENING Pod by adding Band Efficient Common Data Link (BECDL), TTNT, and encryption to the current pod inventory.

These waveforms integrate key components of SRP onto our legacy TACAIR assets and provide expanded capabilities such as two way datalink of video and still pictures, as well as make LITENING ATDL equipped aircraft airborne nodes for HQMC Aviation DI initiatives. Wireless transmission of high definition video to an in-cockpit tablet is another capability that the program will integrate into ATDL. LITENING ATDL is currently scheduled for initial fielding to the fleet concurrent with H7.1 in FY21.

AV-8B HARRIER (VMA) PLAN

UPGRADES

Mode 5 / Mode S – 2021
ADS-B (Out) – 2021
Helmet Mounted Cueing System – 2023
Survivability equipment - 2023

LETHALITY

AIM-9X Block II – 2021
AIM-120C – 2021
Precision Stand Off Weapon – 2021

INTEROPERABILITY

LITENING Gen 4 Advanced Tactical Data Link – 2021
LINK-16 – 2021 Full AV-8B Integration
SATCOM – 2023



AV-8B HARRIER (VMA) PLAN

DEVELOPMENTAL TEST (DT) / OPERATIONAL TEST AND EVALUATION (OT)

- 1) H7.0/H7.1 design and development (Link-16 Strike/Intercept, AIM9X, LPOD COFPv4 and ATDL, APKWS and Intrepid Tiger II CDPs)
- 2) Non-Block Development (APKWS Envelope Expansion Tanks 2 and 6, AIM120C5/7 Ground Vibration Test and Separation)
- 3) JMPS and trainer development support (H7.0—MPE 5.0, Simulator)
- 4) Fleet Support (HarrierHelp, MAWTS-1 Support, fleet briefs, publications edits and updates)



MARINE COMMERCIAL AIR SERVICES PROGRAM

Marine Corps aviation has an increased demand in two areas:

- 1) **Aggressor air-to-air (adversary) training** and
- 2) **Close air support aircraft** for MOS-producing schools and sustainment of FAC/JTAC Marines in the fleet.

Demand in these two areas is growing, and with transition to the F-35 and the increase in terminal attack controllers in the GCE TO and E, Fixed-Wing (FW) support requirements exceed USMC FW capacity. Headquarters Marine Corps Aviation is examining alternatives and solutions for these high demand/low density adversary and CAS training platforms.

One way to mitigate this capacity problem is the Marine Commercial Air Services Program. This investment in vendor-operated services will provide CONUS-based units with regionally operated, low operating cost, terminal attack control and adversary training assets. The Commercial Air Services Program is designed to augment USMC FW support to Fleet Replacement Squadron (FRS) Pilot Training Requirements, fleet aviation adversary requirements, and TACP/FAC(A) production, while improving readiness across the MAGTF. **Contracting vendor-owned and -operated aircraft regionally would support crucial local training requirements. The aircraft would be:**

- 1) **Fighter jets, with similar or better capabilities to USMC F-5s**, to provide fixed-wing adversary support for fixed- and rotary-wing squadrons, as well as for LAAD and command and control training, and
- 2) **Attack aircraft with approved weapons delivery profiles and flight clearances** to augment close air support training for TACP and FAC(A) certification and qualification training, and
- 3) **Refueling aircraft** to provide Marine aviation assets with an aerial refuel capability similar to that of DoD strategic assets.

The Marine Corps F-5 fleet has a service life plan that begins divestiture of current platforms in 2026. Marine aviation is working with the Navy to determine future Department of the Navy adversary requirements and to conduct analysis on future government and vendor operated solutions. The DoN adversary solution will require solution for the increase in adversary demand and an investment in upgraded capability to represent modern and future adversary threats.

Current USMC adversary inventory is 12 F-5s assigned to VMFT-401 at MCAS Yuma that execute local training and detachments to away sites for training support. Marine aviation is researching the requisite manning and logistics to expand adversary capacity and capability while improving accessibility by possibly placing resources at MCAS Beaufort in support of the F35 FRS. Expanding adversary capacity could be accomplished with either government operated aircraft, vendor operated aircraft, or a combination of both.

The current configuration and future upgrades to the F-5 do not meet all of these MAGTF requirements for adversary against F-35 and FA-18, but these aircraft can effectively service many fixed-wing, rotary-wing DACM, GBAD, and C2 training needs. A combination of fleet support and investment in contracted 4th generation fighters will augment the USMC F-5 fleet in supporting high-end adversary training requirements.

Procurement of additional F-5s with significant service life remaining would provide additional organic adversary resources and expand capacity. Headquarters Marine Corps Aviation continues to assess global fighter procurement opportunities, and vendor adversary and attack capabilities to ensure that future adversary and close air support training requirements are supported.

KC-130J/T HERCULES (VMGR) PLAN

VALUE TO THE MAGTF

VMGR squadrons or detachments deploy in support of a MEU or as part of an aviation combat element in response to a request for forces. Deploying elements are capable of conducting operations within 24 hours of arrival, providing the immediate ability to rapidly **extend the operational reach of the MAGTF** and, for detachments equipped with Harvest HAWK, provide organic multi-sensor imagery reconnaissance (MIR) and close air support (CAS).

MISSION STATEMENT

The mission of VMGR is to support the MAGTF commander by providing air-to-air refueling, assault support, CAS and MIR, day or night under all weather conditions during expeditionary, joint, or combined operations.

CAPABILITIES

Since IOC in 2005, the KC-130J has proved its value by operating from austere airfields in forward operating areas and providing mission support in emergency evacuation of personnel and key equipment, advanced party reconnaissance, tactical recovery of aircraft and personnel, special warfare operations, intelligence, surveillance, reconnaissance, target acquisition, indirect and direct fires adjustment, battlefield damage assessment and destroying ground targets.

The KC-130J is also tasked to

- Conduct aviation operations from expeditionary shore-based sites
- Conduct combat assault transport
- Conduct air-to-air refueling (AAR)
- Provide aviation-delivered ground refueling (ADGR)
- Conduct air delivery (AD)
- Provide aviation delivered battlefield illumination (BI)
- Conduct CAS (when properly equipped)
- Conduct MIR (when properly equipped)



KC-130J/T HERCULES (VMGR) PLAN

CAPABILITIES

Aircraft Specifications KC-130J / T

- Range (20,000-lb payload) 3,250 nm / 3,000nm
- Empty weight: 91,000 pounds / 87,000 lbs
- Fuel capacity: 58,500 pounds
- Max normal takeoff weight (2.0g) 164,000lbs / 155,000 lbs
- Max cruise: 320 KTAS / 300 KTAS
- Cruise ceiling: 25,000 ft
- Fuel offload @ 1200nm / 20,000 ft: 30,000 lbs
- Passenger capacity (ground troops): 92
- Paratroop capacity: 64
- Air ambulance litter capacity: 74

Configuration

- Radar Warning Receiver: ALR-56M / APR-39A(V)2
- Advanced Missile Warning System: AAR-47(V)2
- Advanced IR Countermeasure System: ALQ-157A(V)1
- Advanced Countermeasure Dispenser System: ALE-47
- DoN LAIRCM/ATW with HFI: AAQ-24B(V)25
- Harvest HAWK

Notional Mission Profile

- FWAAR
 - Range/Time on Station (TOS)- 150nm transit, 3+00 TOS, 150nm RTB
 - Cargo frame fuel available @ 20,000ft: 30,000 lbs
 - Tanker frame fuel available @ 20,000ft: 54,000 lbs

HARVEST HAWK

The USMC fields a bolt-on/bolt-off ISR/weapon mission kit for use on existing KC-130J aircraft. A total of 10 aircraft are modified to employ the 6 Harvest HAWK kits: 5 modified aircraft with 3 kits in 2d MAW, and 5 modified aircraft with 3 kits in 3d MAW.

The mission kit configures the KC-130J aircraft into a platform capable of performing persistent targeting MIR and delivering precision fires using either Hellfire or Standoff Precision Guided Munitions (SOPGM) such as the Griffin. This mission kit is a complementary capability taking advantage of the aircraft's endurance and range.

First deployed in October 2010, Harvest HAWK provides the MAGTF commander with a platform capable of extended endurance multi-sensor imagery reconnaissance and **on-call close air support** in low threat scenarios.

Only VMGR-252 and VMGR-352 are trained and equipped to provide MIR and CAS.



KC-130J/T HERCULES (VMGR) PLAN

ORGANIZATION

VMGR squadrons are structured to support a home station element and one enduring three-aircraft detachment. The home station element is capable of dual-shift maintenance, while the detachment is only single- shift maintenance-capable. There is surge capability within a VMGR to provide an additional deployable detachment in support of simultaneous contingencies; however, the squadron is not structured to sustain the additional detachment on an enduring basis.

Additionally, detachment size is always scalable to meet the assigned MAGTF mission.

Each squadron is responsible for core skill introduction training of pilots and aircrew. Though there is no standing FRS, initial accessions are assigned to the Fleet Replacement Detachment at 2nd MAW and training is conducted utilizing MATSS' Weapons Systems Trainers (WSTs); Cockpit Procedures Trainers (CPTs); Fuselage Trainers (FuTs) and Observer Trainer (OTAs).

The Marine Corps has delivered 62% of the required KC-130J aircraft and transition is complete for the active component. Total procurement is planned to be 86 KC-130Js with the last delivery scheduled for 2027.

75 aircraft will be designated as Primary Mission Aircraft Inventory (PMAI), 10 designated as Backup Aircraft Inventory (BAI), and 1 designated as Primary Development/Test Aircraft Inventory (PDAI) with the following breakdown:

- 1) 3 active squadrons x 15 PMAI / 2 BAI
- 2) 2 reserve squadrons x 15 PMAI / 2 BAI *
- 3) 1 test squadron x 1 PDAI

* 15 aircraft RC squadrons is an HQMC Aviation initiative to mirror the RC to the AC and requires further review and development in accordance with the Total Force Structure Process.

MANPOWER

Due to the continued demand for the KC-130, this community's personnel tempo is the highest in Marine aviation. The structure of VMGR continues to be evaluated to ensure we have the right force to meet the requirement. The addition of Harvest HAWK in 2010 placed an added manpower requirement on the community, and initiatives like Future Force 2025 will provide additional manpower structure to meet this requirement.

Training and maintaining qualified crewmasters remains an issue for the community. The consolidation of the crew chief and loadmaster crew positions in 2009 has not yet realized the desired efficiencies. Targeted adjustments to the T and R make some improvement, but we will not make real strides until after the Enhanced Enlisted Aircrew Training Systems are delivered (FY20-21) and operating efficiently. We continue to pursue near-term solutions, such as hiring contracted crewmaster instructors.

VMGR-452 is the last remaining legacy T-model squadron and sustaining manpower through the J-model transition is crucial.

Maintaining qualified legacy aircrew continues to be a challenge, the most immediate limitation being pilots. We have processes in place to train/sustain aircrew, with the biggest obstacle's being recruiting well qualified pilots to grow an instructor cadre.

KC-130J/T HERCULES (VMGR) PLAN

CURRENT FORCE:

3 AC SQDN X 15 KC-130J
 1 RC SQDN X 7 KC-130J
 1 RC SQDN X 12 KC-130T

FUTURE FORCE (FY2026):

3 AC SQDN X 15 KC-130J
 2 RC SQDN X 12 KC-130J

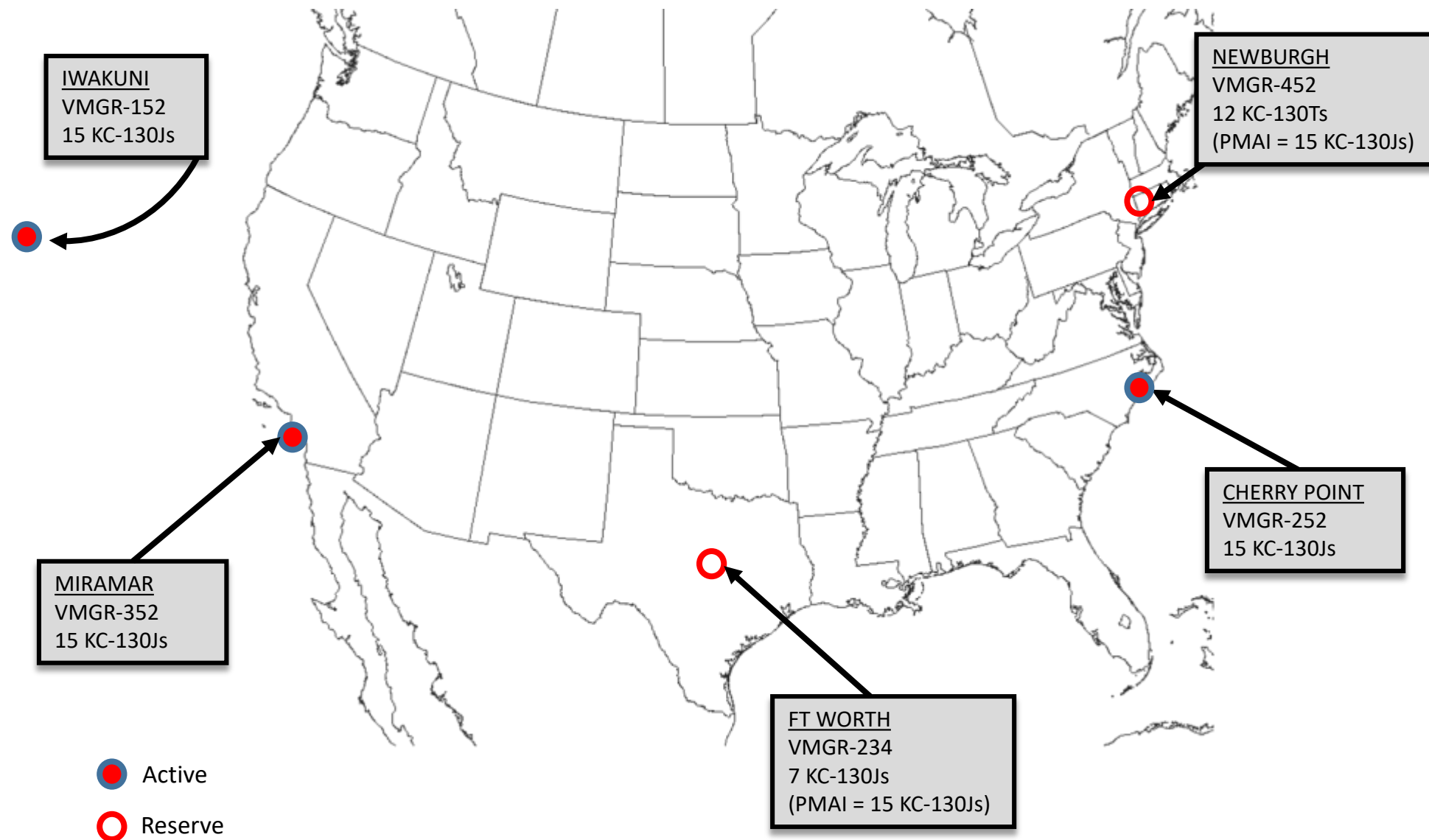
UNIT / LOCATION	PAI	FY19				FY20				FY21				FY22				FY23				FY24				FY25				FY26				FY27				FY28			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
MAG-11 / MIRAMAR, CA																																									
VMGR-352	15 KC-130J																																								
3MAW MATSS	WST									Note 3, 7																															
	CPT	Note 5,9								Note 7																															
	FuT	Note 1,2,7,9																																							
	HH PTT													Note 3																											
	OTA	Note 1,5,7,9																																							
MAG-12 / IWAKUNI, JA																																									
VMGR-152	15 KC-130J																																								
1MAW MATSS	WST													Note 3																											
	CPT	Note 5,11																																							
	FuT	Note 1,11																																							
	OTA	Note 1,5,11																																							
MAG-14 / CHERRY POINT, NC																																									
VMGR-252	15 KC-130J																																								
2MAW MATSS	WST									Note 3,7																															
	CPT									Note 7																															
	FuT	Note 1,4,7																																							
	HH PTT													Note 3																											
	OTA	Note 1,4,7																																							
MAG-41 (RESERVE COMPONENT) / FORT WORTH, TX																																									
VMGR-234	8 KC-130J													12 KC-130J												Note 12															
4MAW MATSS	WST	Note 5,6,10																Note 3																							
	CPT	Note 5,10																																							
	FuT	Note 1,10																																							
	OTA	Note 1,10																																							
MAG-49 (RESERVE COMPONENT) / NEWBURGH, NY																																									
VMGR-452	12 KC-130T				J													12 KC-130J								Note 12															
4MAW MATSS	WST					Note 2,8																																			
	CPT					Note 2,8																																			
	FuT					Note 1,2,8																																			
	OTA					Note 1,2,8																																			

 New build
 Device undergoing mod/upgrade
 J = KC-130J transition begins
 V = KC-130J IOC (5 KC-130Js)

NOTES:

- | | | |
|---|--|--|
| 1) Trainer can perform in Standalone or connected to WST for full CRM training
2) MILCON required to support this trainer
3) Technology refresh/modernization | 4) This trainer will go into FuT building (P-229)
5) This trainer will be in temp location until FuT building is complete
6) Ready for Training May 2018
7) Reconfigurable BU6.5-3 to BU8.1 reconfigurable modification
8) Device currently unfunded | 9) Trainer will go into new building (P-200)
10) Trainer will go into new building (P-077)
11) Trainer will go into new building (P-1006)
12) Aviation initiative to mirror RC to AC as 15 aircraft squadrons. Further DOTMLPF development required |
|---|--|--|

KC-130J/T HERCULES (VMGR) PLAN



KC-130J/T HERCULES (VMGR) PLAN

SUSTAINMENT

The **biggest factor in readiness and KC-130 availability is lack of aircraft on the flight line.** Due to the prolonged procurement phase of the KC-130J, we do not expect backup aircraft to deliver until FY24.

The KC-130J is a maturing platform that has completed its transition in the active component and will reach FOC in the reserves in FY23. It continues to meet all operational commitments. O-Level maintenance is affected by the move from Maintenance Core Competency (MCC) to Required Maintainer Competency (RMC). Designed to provide a more exact description of a squadron's maintenance capability, this transition has shown deficits in qualifications that require squadrons to intensify their training programs.

Depot maintenance for the KC-130 is also affected by transition. In FY16, WESTPAC events transferred to depot facility AIROD in Malaysia. In FY19, WESTPAC events will be conducted in CONUS.

In FY18, CONUS events began a transition from Ogden Air Logistics Complex to Warner Robins Air Logistics Complex. This transition is expected to be complete by FY22. As a result of these moves, we need to be mindful and aware of possible increases in turn-around-times and costs.

The KC-130J program achieved Material Support Date four years early, in October 2016. With this effort, there have been a flood of new contracts for over 200 new parts. NAVSUP and DLA are providing outstanding support and improvements are being realized. The KC-130 team continues to work closely with all supporting entities including NAVSUP and Defense Logistics Agency to address current supply shortfalls, improve forecasting, and drive down the overall impact of non-mission capable supply issues to the fleet as a whole.



RESERVE INTEGRATION

The reserve component began its transition in March 2014 with VMGR-234, in Fort Worth, Texas, and achieved IOC in August 2015. VMGR-452 is planned to begin its transition in 2019 and reach FOC in FY23. BAI procurement is deferred until the reserve component reaches 12 aircraft and will complete delivery in FY27.

Legacy KC-130T aircraft will continue operation in 4th MAW until VMGR-452 reaches KC-130J IOC - planned for FY21. The Electronic Propeller Control System, Engine Instrument Display System, TACAN, and radar systems modifications are complete for the KC-130T.

Additionally, Diminishing Manufacturing Sources and Material Shortages (DMSMS) as well as CNS/ATM mandates will need to be addressed in order to sustain and maintain relevance through 2020. KC-130T Tactical Systems Operators and Flight Engineers will continue to be required until KC-130J IOC at VMGR-452 and will begin to reach critical levels in 2021. There is currently no means in place to train additional Tactical Systems Operators.

KC-130J/T HERCULES (VMGR) PLAN

INITIATIVES AND WAY AHEAD

KC-130J BLOCK UPGRADE PROGRAM

The USMC participates in a joint users group with the USAF and seven international partner nations, to reduce costs associated with the development and fielding of updated baseline configurations resulting from emerging requirements and diminishing manufacturing sources.

These new configurations include system and safety improvements and satisfy known CNS/ATM mandates. Block 8.1 is the new baseline for all DoD and international C-130J users, which includes Link 16, Mode 5 IFF, GPS approach capability, ADS-B (out), RNP/RNAV, and includes a new flight management system.

As the KC-130J evolves through its block upgrade program, the incorporation of digital interoperability via Link 16 will enhance MAGTF command and control agencies' intelligence collection and targeting capability across the force.



HARVEST HAWK

During 2019, Harvest HAWK completed test of the sensor and fire control system upgrades and addressed system obsolescence and deficiencies. Efforts continue with the transition from P2A Hellfire to the P4 Hellfire, with Joint Air-Ground Munition beginning in FY20. The new modifications to the Harvest HAWK aircraft will be available for tasking in FY19.

Additional modifications associated with OWS430 are ongoing with the nine remaining installs scheduled to start in 2021. With this modification complete, Harvest HAWK aircraft will recover its original air-to-air refueling configuration of 58,500 pounds of fuel and two air-to-air refueling pods.

UPGRADES

LETHALITY

Intrepid Tiger II

Hellfire P+/P4

TSS to MX-20 transition

Fire Control Station to Mission Operator Pallet transition

JAGM integration

ASE/SURVIVABILITY

DoN LAIRCM/ATW with HFI, AAQ-24B(V)25 – 18 modifications completed through FY18.

KC-130J/T HERCULES (VMGR) PLAN

INTEROPERABILITY

Dual Vortex – Test completed in FY17 and four remaining modifications scheduled for FY20.

Block 8.1 is in developmental test and operational test is scheduled for FY19 with fleet install beginning in FY20.

DEVELOPMENTAL TEST

1) The trial-kit installation and developmental test for Block 8.1 was scheduled for FY18 with follow-on operational test in FY19.

2) In response to an UNS, Intrepid Tiger II on KC-130J was approved as a Rapid Deployment Capability and entered test in FY18.

OPERATIONAL TEST AND EVALUATION

Harvest HAWK and DoN LAIRCM conducted OT during FY19. Modification of OWS430 is expected in FY19 with test planned for FY20.



MV-22B OSPREY (VMM) PLAN

VALUE TO THE MAGTF

In 1999 the Marine Corps procured its first MV-22 Osprey. Since the first deployment in 2007, the MV-22's revolutionary capability has been a cornerstone of the Marine Air-Ground Task Force. MV-22s provide medium lift assault support to ground forces in multiple theaters of operation. The Osprey enables expeditionary operations with its unrivaled ship-to-shore speed and increases operational flexibility for ground commanders.

The MV-22 successfully blends the vertical flight capabilities of a helicopter with the speed, range, altitude and endurance of fixed-wing transports. The Osprey's ability to deliver combat troops and logistic support to the objective is representative of the MAGTF's assault support overmatch. No peer or near-peer adversary has a like capability.

Combatant commanders and the MAGTF have come to count on the speed, range, and flexibility of the MV-22. The Osprey provides combat troop transport, resupply, air-delivered ground refueling, and aerial delivery from sea and shore bases in support of the full range of military operations.

MISSION STATEMENT

Support the MAGTF commander by providing day/night all weather assault support by transporting combat troops and equipment during expeditionary, joint, or combined operations.



MV-22B OSPREY (VMM) PLAN

CAPABILITIES

Aircraft Specifications

- Combat radius: 420nm
- Empty weight : 35,000 pounds
- Max gross weights: 52,600 pounds VTOL / 57,000 pounds STO
- Payload: 24 passengers / 12 litters / 12,500 lbs internal / 10,000 lbs external
- Speed (cruise/max): 240 knots / 280 knots

Configuration

- Mission Kits: Defensive Weapon System
- Armament: GAU-21 .50 Cal or M240 7.62 on ramp; GAU-17 7.62 belly gun
- Sensors: AN/AAQ-27 (NavFLIR)
- Networked Systems: BFT; *NOTM-A, *Link-16, *CDL, *TTNT, *ANW2 (*SPMAGTF C4I UUNS solution)
- ASE: AAR-47 C(V)2, ALE-47, APR-39, DoN LAIRCM

Notional Mission Profile

- Amphibious pre-assault raid
 - Flight profile- Take-off no wind, sea level; 200 nm transit to 3000 ft MSL CAL with 30 min loiter in zone and return to ship.
 - Payload- 18 combat-equipped Marines or ITV with 3 Marines
- Amphibious troop lift
 - Flight profile- Take-off no wind, sea level; 50 nm transit to 3000 ft MSL, 40 min loiter overhead; return to ship with 15 min loiter at ship
 - Payload- 24 combat-equipped Marines or ITV with 3 Marines

- Amphibious external lift
 - Flight profile- Pick up no wind, sea level; 50 nm transit to 3000 ft MSL CAL; 5 min HOGE in zone; return to ship with 15 loiter at ship
 - Payload- 10,000 external cargo load
- Land assault troop lift
 - Flight profile- Take-off from CAL at 3000 ft MSL; transit 200nm to 3000 ft MSL CAL; return to point of origin
 - Payload- 24 combat-equipped Marines or ITV with 3 Marines
- Land assault external lift
 - Flight profile- Pick up no wind, HOGE, 3000ft MSL; 50 nm transit to 3000 ft MSL CAL; 5 min HOGE in zone; return to point of origin.
 - Payload- 10,000 external cargo load
- Self-Deploy
 - Range- 2100nm at 10,000 MSL with 20 min fuel reserve at each refuel point in 12 hours or less



MV-22B OSPREY (VMM) PLAN

ORGANIZATION

Marine Corps MV-22B squadrons are organized to support the operations and maintenance of 12 aircraft. The squadron may also conduct split-site as two 6-plane detachments.

The Marine Corps will procure a total of 360 MV-22B's in the following squadron bed-down:

- 1) 18 active squadrons x 12 MV-22B
- 2) 2 reserve squadrons x 12 MV-22B
- 3) 1 fleet replacement squadron x 20 MV-22B

The Marine Corps is nearly complete with the medium lift transition. There are seventeen squadrons in the active fleet and 2 reserve component squadrons. VMM-362 at MCAS Miramar will achieve IOC in early 2019, leaving only one squadron left to stand-up – VMM-212 at MCAS New River in the first quarter of FY21.

The Marine Corps will declare full operational capability with all squadrons formed and the 360th aircraft delivered.



MV-22B OSPREY (VMM) PLAN

MANPOWER

The VMM detachment structure is in place. Existing inventory shortfalls (qualifications and experience) prevent actualization of full detachment staffing in the near term. The grade disparities evident in previous years, which resulted from 202K downsizing and a strong economy, continue to impact pilot, enlisted aircrew and maintainer populations.

HQMC Aviation ensures the force structure requirement is accurate in order to provide the correct demand signal to planners and personnel monitors at Manpower and Reserve Affairs.

Marine Corps TFSMS currently reflects the MV-22 transition depicted in the AvPlan. The MV-22 cell focuses on setting the proper conditions for the completion of the transition, while not increasing overall aviation force structure. There are several initiatives ongoing to ensure future inventory is available during the transition.

With the force structure and newer aircraft already in place, Marine aviation is focused on increasing capacity at VMMT-204 to meet current and future aircrew production. HQMC Aviation continues to advocate for appropriate staffing levels to match increased flight hour production associated with increased training requirements. VMMT-204 is the only tiltrotor initial training squadron in the DoD. It is responsible for training Air Force, Marine Corps, Navy, and Japanese Ground Self Defense Force pilots, aircrew, and maintainers.

HQMC Aviation is concerned with the personnel deficit in the VMMs. We are analyzing VMM activation timelines to ensure the fleet can support existing requirements and absorb increasing requirements without creating the burden of “overtrain” associated with the HMM to VMM transition.



MV-22B OSPREY (VMM) PLAN

SUSTAINMENT

The V-22 Readiness Program (VRP) is a holistic approach to platform readiness recovery. It encompasses all training, sustainment, and platform modification initiatives that contribute to the goal of meeting the OSD readiness benchmark of 80%. The two largest initiatives under VRP, by expenditure, are Common Configuration – Reliability and Modernization (CC-RAM) and Nacelle Improvement (NI). The Osprey's best chance at overcoming the current readiness plateau of 55% relies on executing CC-RAM and NI in parallel. A common configuration that implements component re-design, modern avionics, and design improvements to facilitate maintenance are required for closing the readiness gap. CC-RAM will update older aircraft and bring the entire fleet to a minimum number of configurations, greatly simplifying the maintenance load.

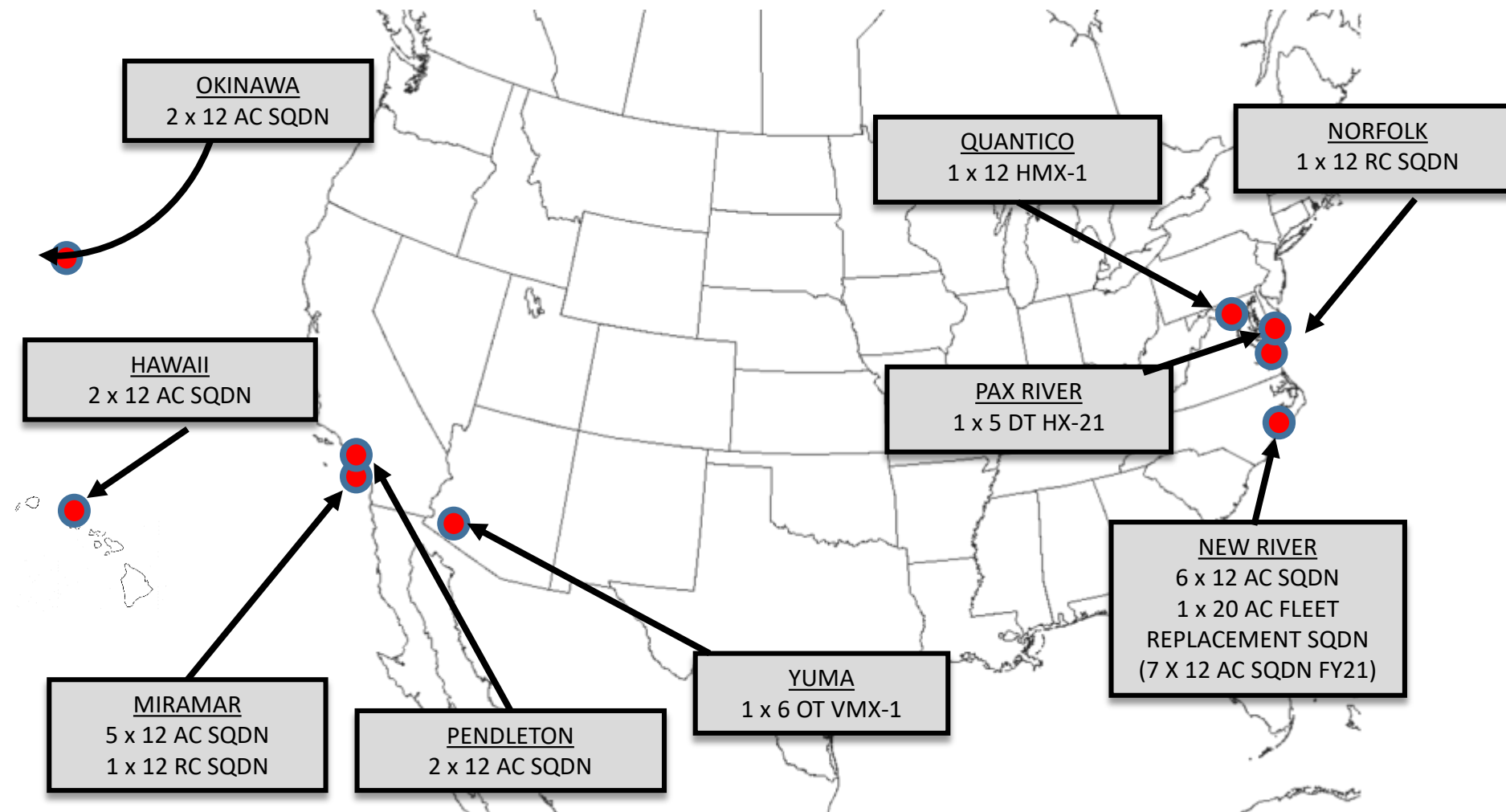
The Depot Readiness Initiative (DRI) will give the depots the ability to complete O-Level tasks, such as phases and TD incorporation, simultaneously with PMI events, greatly reducing the O-Level work required to return post depot aircraft to flight status.

HQMC Aviation, in conjunction with PMA-275, instituted a number of readiness improvement efforts by implementing recommendations from the Osprey Independent Readiness Review and best practices from the joint services. Marine aviation is using an “all of the above” strategy through performance based logistics to incentivize industry partners to increase both the number of components available in addition to the types of components available. Component reliability initiatives and conditions based algorithms round out the materiel focus.

The largest readiness provider for the MV-22 is a Marine. To that end, aviation maintainers are being better supported by larger engineering and artisan teams, contract trainers, and – where needed -contract maintenance.



MV-22B OSPREY (VMM) PLAN



MV-22B OSPREY (VMM) PLAN

RESERVE INTEGRATION

VMM-764 and VMM-774 support the active force, deploying in support of SPMAGTF(CR) requirements.

4th MAW stands by to alleviate stresses in the fleet Marine force operation tempo in support of enduring requirements or to augment Active Component forces in the eventuality of a major combat action.

MARFORRES is exploring possibilities of beddown relocation for VMM-744 due to facility constraints at NAS Norfolk, with a desire to remain in the Norfolk area to retain the area's recruiting advantages.



MV-22B OSPREY (VMM) PLAN

INITIATIVES AND WAY AHEAD

As the core of the MEU ACE and centerpiece of MAGTF amphibious lift, the Osprey must continue to evolve.

Its evolution over the next five years will focus on:

- 1) Facilities, readiness and sustainability for the growing fleet.
- 2) Improving Degraded Visual Environment (DVE) flight capabilities including development of a new flight control computer to improve aircraft handling qualities, and incorporation of Enhanced Visual Acuity (EVA).
- 3) Aircraft survivability equipment upgrades.
- 4) Digital Interoperability including the MAGTF Agile Network Gateway Link (MANGL) to bring on Link 16, CDL, ANW2 and TTNT.
- 5) Adding mission kits to support expanded mission sets like Network On The Move- Airborne (NOTM-A).

AIRFRAME IMPROVEMENTS, SPECIFICS, TEST

In 2018 the Common Configuration-Readiness and Modernization (CC-RAM) Plan began. This effort will bring all block Bs and early Block Cs to a late model Block C production configuration, while beginning a 2 year technology insertion cycle to leverage technologies from joint multi-role (JMR), future vertical lift (FVL), and other emerging technology initiatives. These will ensure that the MV-22 maintains its battlefield superiority while improving readiness at a lower cost for decades.

DEGRADED VISUAL ENVIRONMENT (DVE)

The design of the MV-22 poses unique challenges when operating in a dusty or obscured environment. In order to safely operate in its all conditions role, the MV-22 requires a suite of capabilities; improved flight control logic to improve aircraft handling qualities, improved visualization and sensors, improved pilot cueing and open system avionics architecture necessary to host the system of systems.

COMMON CONFIGURATION READINESS AND MODERNIZATION PLAN (CC-RAM PLAN):

- Over 75 configurations down to 25, and then to 5 at completion
- First induction 2Q FY18 with a progressive ramp
- Ramping to 24 aircraft modifications per year until complete
- Initial Block B to Block C modifications for 129 aircraft
- 126 early Block C to late Block C installs to achieve production configuration
- Subsequent CC-RAM aircraft tech insertions will occur every 4-6 years in continuous technology improvement cycles

Readiness and reliability improvements and capability improvements will be bundled into CC-RAM tech insertion cycles as they mature and are affordable.

MV-22B OSPREY (VMM) PLAN

READINESS AND RELIABILITY

Electrical System GCU Relocation: 48 installs per year FY20-Until Complete (345 installs)

Electrical System Generator Upgrade: 9-24 installs per year FY21-Until Complete (345 installs)

Variable Frequency Generator (VFG) Generator Control Unit (GCU) Update: 91-96 installs per year FY18-FY20 (283 installs)

Prop-Rotor Gear Box (PRGB) Input/quill redesign: 60 installs per year FY19-FY22 (240 installs)

Landing Gear Control Unit upgrade: 60 installs per year FY19-FY21 (180 installs)

Block B Mission Computer Obsolescence Initiative (MCOI) retrofit: 18-24 installs per year, FY20-Until Complete (129 installs)

Nacelle Improvements: 6-24 installs per year FY21-Until Complete (337 installs) (Completed in conjunction with CC-RAM)

Standby Flight Display: 60 installs per year, FY18-FY22 (300 installs)

CAPABILITY

Traffic Collision and Avoidance System (TCAS): 24-35 installs per Year FY17-FY22 (175 installs)

IASE CV2: Installs complete with 12 in FY18 (72 installs).

IASE DV2/LSPR: Installs 12 per year FY18-To Complete (172 installs)

INTEROPERABILITY

Digital Interoperability/Software Reprogrammable Payload: 46 installs per year FY19-Until Complete (266 installs)

Iridium Antenna to provide Beyond Line Of Sight (BLOS) C2 capabilities: 48-51 installs per year FY18-Until Complete (291 installs)



MV-22B OSPREY (VMM) PLAN

DEVELOPMENTAL TEST EFFORTS:

- 1) Fleet sustainment – Vehicle Management System (VMS) and JVX Application System Software (JASS) software drops
- 2) Nacelle improvements
- 3) Envelope expansion and high gross weight testing for shipboard operations
- 4) High altitude operations and defensive maneuvering
- 5) Strategic tanker envelope expansion

OPERATIONAL TEST AND EVALUATION EFFORTS:

- 1) White phosphor NVG qualification and TTP generation
- 2) Defensive weapon system envelope expansion
- 3) Digital interoperability
- 4) Integrated aircraft survivability equipment
- 5) DVE sensors and solutions



UH-1/AH-1 (HML/A) PLAN

VALUE TO THE MAGTF

The AH-1Z, AH-1W and UH-1Y support the full spectrum of warfare in range, combat power, and flexibility on the battlefield. The H-1 upgrade program (AH-1Z, UH-1Y) capitalizes on 85% commonality of major components to streamline logistical sustainment and flight line maintenance. The unique and complimentary capabilities of the AH-1Z, AH-1W and UH-1Y make them the only platforms in the inventory that, when combined, conduct all six functions of Marine aviation.

MISSION STATEMENT

The mission of the HMLA is to support the MAGTF commander by providing offensive air support, utility support, armed escort, and airborne supporting arms coordination, day or night under all weather conditions during expeditionary, joint or combined operations.

CAPABILITIES

The H-1 program consists of three type, model, series (TMS) aircraft: the AH-1Z, UH-1Y and the legacy AH-1W. The H-1 upgrade program is a single acquisition program leveraging 85% commonality of major components, enhancing deployability and maintainability.

The AH-1Z Viper is replacing the AH-1W Super Cobra, while the UH-1Y Venom replaced the UH-1N Huey. The Viper is the next generation of attack aircraft and Venom is the next generation utility aircraft. Speed, range, and payload for both aircraft have been increased, while decreasing maintenance workloads, training timelines, and total ownership cost. The advanced cockpit of the AH-1Z and UH-1Y, reduces operator workload, improves situational awareness and provides growth potential for future weapons and joint digital interoperability enhancements.

AH-1Z

Aircraft Specifications

- Empty weight: 12,300 pounds
- Max gross weight: 18,500 pounds
- Useful payload: 5,764 pounds (HOGE)
- Speed (cruise/max): 139 kts/ 190 kts

Configuration

- Weapons Stations: 6
- Armament: 20mm cannon
2.75" rockets (guided/unguided)
AGM-114 Hellfire
AIM-9 Sidewinder
- Sensors: Target Sight System (TSS)
- Networked Systems: Adaptive Networking Wideband Waveform (ANW2)
Full Motion Video (FMV)
- Aircraft Survivability: APR-39B(V)2
AAR-47B(V)2
ALE-47

Notional Mission Profile (Offensive Air Support)

- Range / time on station: 50 NM mile transit to objective
1 hour time on station
50 nautical mile return to

base

- Loadout: 8 AGM-114
38 2.75" rockets
500 20mm

UH-1/AH-1 (HML/A) PLAN

UH-1Y

Aircraft specifications

- Empty weight: 11,840 pounds
- Max gross weight: 18,500 pounds
- Useful payload: 5,930 pounds (HOGE)
- Speed (cruise/max): 139 kts/ 170 kts

Configuration

- Weapons stations: 2
- Armament: 2.75" rockets (guided and unguided), GAU-17A, GAU-21, M240D
- Sensors: Brite Star Block II, Intrepid Tiger II
- Networked systems: Adaptive Networking Wideband Waveform (ANW2), Full Motion Video (FMV), Tactical Targeting Network Technology (TTNT)
- ASE: APR-39B(V)2
AAR-47B(V)2
ALE-47

Notional mission profile:(Offensive Air Support/Assault Support)

- Range/time on station: 119 nautical mile transit
20 minute time on station
Return to base w/ 20 min fuel reserve
- Loadout: GAU-17A
GAU-21
8 combat-loaded Marines

AH-1W

Aircraft specifications

- Empty weight: 10,750 pounds
- Max gross weight: 14,750 pounds
- Useful payload: 3,986 pounds (HOGE)
- Speed (cruise/max): 131 kts/ 170 kts

Configuration

- Weapons stations: 4
- Armament: 20mm cannon
2.75" rockets (guided and unguided)
AGM-114 Hellfire air to ground missiles
AIM-9 Sidewinder air to air missiles
- Sensors: Night Targeting System Upgrade (NTSU)
- Networked Systems: Tactical Video Data Link (TVDL)
- ASE: AAR-47A(V)2
ALE-47
ALQ-144 A(V)1
APR-39A(V)2

Notional mission profile (Offensive Air Support)

- Range / time on station: 50nm transit to objective
30 minutes time on station
50nm return to base
- Loadout: 8 AGM-114
14 2.75" rockets
500 20mm

UH-1/AH-1 (HML/A) PLAN

HML/A ORGANIZATION

MAG-39 and MAG-24 are complete with the AH-1Z and UH-1Y transition. MAG-29 began the AH-1Z transition in fall of 2018. The Reserve Component will begin the transition in fall of 2019. In FY 2022, the active and reserve squadrons will be fully transitioned to the AH-1Z and UH-1Y.

HMLAs are organized to break into detachments of up to five AH-1W/Z and four UH-1Y aircraft.

FLEET REPLACEMENT SQUADRON

HMLAT-303 no longer produces AH-1W replacement aircrew. In eliminating the AH-1W training requirement, the FRS gained additional capacity in AH-1Z initial accession and pilot conversion throughput. The Reserve Component has assumed the AH-1W model manager responsibilities and refresher training requirements.

MANPOWER

HQMC Aviation ensures the force structure requirement is accurate in order to provide the correct demand signal to planners and assignments monitors at Manpower and Reserve Affairs.

The Marine Corps' Total Force Structure Management System (TFSMS) and unit Tables of Organization reflect the H-1 transition as depicted in the AvPlan. The H-1 cell continues to focus on setting the proper conditions for the AH-1Z transition without increasing overall aviation force structure. HQMC Aviation has several ongoing initiatives to ensure the correct force structure and subsequent inventory is in place to complete the AH-1Z transition.

RESERVE INTEGRATION

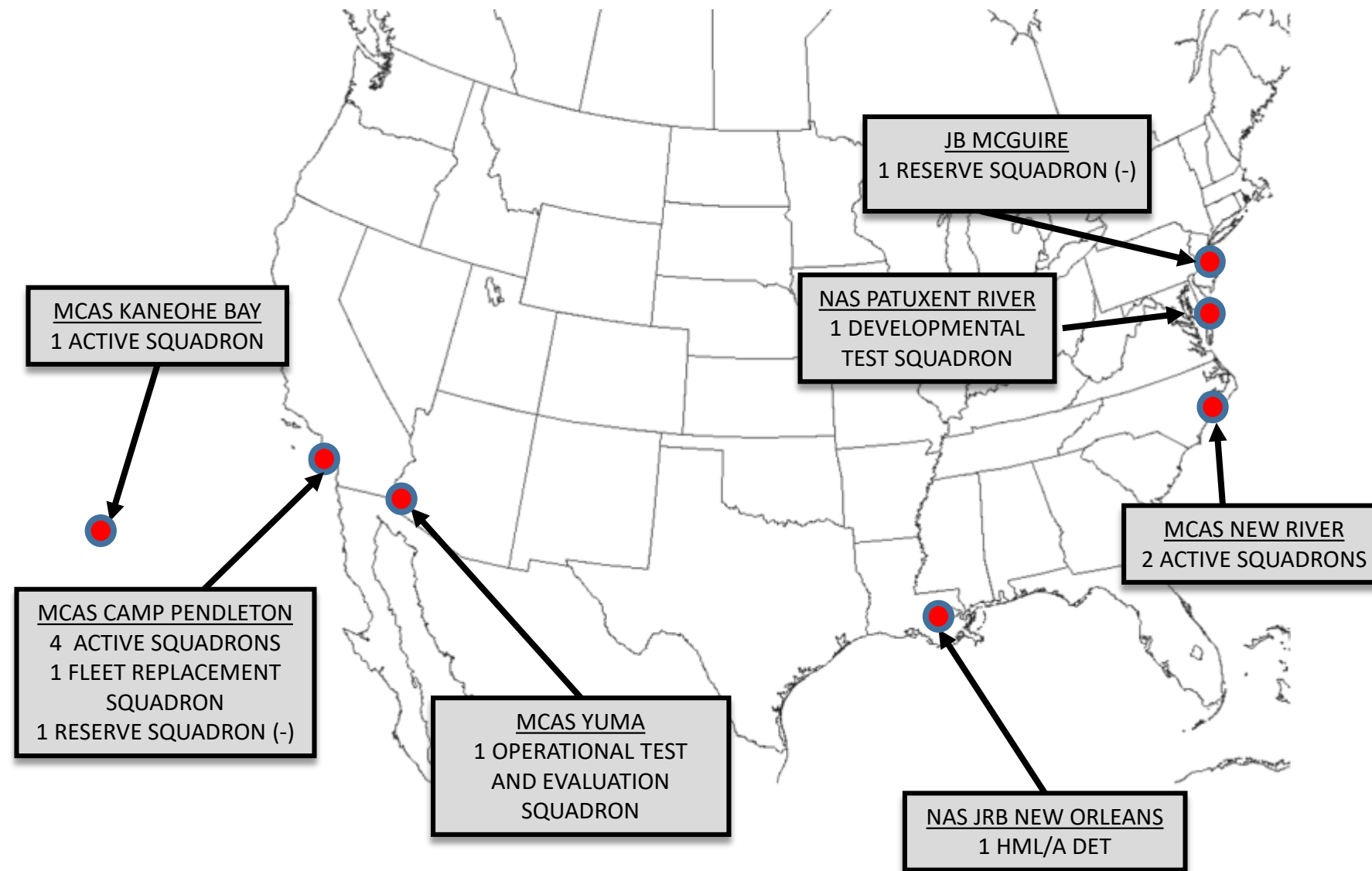
HMLA-775(-) aboard MCAS Camp Pendleton begins AH-1Z transition in FY 2020. This will be followed by HML/A-773 at JRB McGuire and Det A at NAS New Orleans in FY 2021. In FY22, the Reserve Component transition will be complete, adding strategic depth and operational capacity in support of the total force.

INITIATIVES AND WAY AHEAD

The future readiness plan is encapsulated by a configuration management initiative. This effort will bring the fleet to a single hardware and software configuration. Improvements leveraging technologies from multiple sources, to include Future Vertical Lift (FVL), will increase capability ensuring relevance and readiness at an affordable cost for decades. Additionally, the program will increase capability in digital interoperability, all weather navigation and operations, and stores and extended range in an integrated interface optimization effort.



UH-1 / AH-1 (HML/A) PLAN



UH-1/AH-1 (HML/A) PLAN

UPGRADES

Electrical and structural improvements
Drive train/dynamic component improvements
Tech Refresh Mission Computer (TRMC) retrofit
APR-39(D)V2 retrofit
ANS/ADTS installation

ASE/SURVIVABILITY

APR-39(D)V2 retrofit
Distributed Aperture Infrared Countermeasures (DAIRCM)

WEAPONS

Joint Air to Ground Missile (JAGM)
AIM-9X

INTEROPERABILITY

Full Motion Video
LINK-16
Adaptive Networking Wideband Waveform (ANW2)
Tactical Targeting Network Technology (TTNT)

ALL WEATHER NAVIGATION AND OPERATION:

Embedded GPS/Inertial Navigation System (EGI) upgrade
Required Navigation Performance (RNP) / Area Navigation (RNAV) upgrade
Terrain Awareness Warning System II (TAWS II) integration
Identification Friend or Foe (IFF) Improvement

INTERFACE OPTIMIZATION:

Optimized Top Owl and HMSD improvement
Agile software development

DEVELOPMENTAL TEST

- 1) Fleet sustainment: Vehicle Management System (VMS) and JVX Application System Software (JASS) software release
- 2) SCS 8.2 (APR 39D(V)2 integration, JAGM integration, technical corrections)
- 3) AH-1Z JAGM flight testing
- 4) DI-FMV: Spiral 1.2
- 5) FMS support testing
- 6) JUONS Distributed Aperture Infrared Countermeasures (DAIRCM)
- 7) Envelope expansion for shipboard operations

OPERATIONAL TEST AND EVALUATION

- 1) Brite Star Block II Laser Spot Tracker
- 2) TRMC software
- 3) DI-FMV spiral 1.2 developmental and cyber security
- 4) Intrepid Tiger II operational test
- 5) DAIRCM quick reaction assessment
- 6) APR-39D(V)2
- 7) SCS 8.2
- 8) AH-1Z JAGM flight testing
- 9) Intrepid Tiger II correction of deficiencies



FUTURE VERTICAL LIFT

The MAGTF will operate and fight at sea, from the sea, and ashore as an integrated part of the naval force and the larger combined/joint force. To execute this concept, the MAGTF requires complimentary and synchronized capabilities across the warfighting functions to effectively conduct maneuver warfare and project power from a diverse array of lodgments, sea-bases, and expeditionary advanced bases. Speed, agility, and depth is required to provide our Marine infantryman with proper support. Distributed Aviation Operations increase operational reach, increase capacity, reduce risk within anti-access/area denial (A2/AD) environments, capitalize on economy of force, provides flexibility, and enables surprise.

The future battlefield and evolving threat necessitates the development of aircraft that possess range, speed, maneuverability, and survivability to operate in expeditionary environments. The F-35 and the MV-22B have revolutionized Marine Corps aviation. As we develop weapons and tactics to counter the future threat there is a need to develop aircraft that complement the F-35 and MV-22B to further enhance the Marine Air Ground Task Force. To meet this goal, the Marine Corps Future Vertical Lift Capability Set 3 (FVL CS 3) rotorcraft is the concept that will fill the roles, missions, and requirements to effectively operate in the future operating environment.

FVL CS 3 will provide revolutionary rotorcraft capability that will redefine the operating concepts for the next generation of vertical take-off and landing aircraft. FVL will incorporate advanced aerodynamic capabilities which will fundamentally alter historic metrics

for land force mobility, responsiveness, sustainability, readiness, and lethality. FVL CS 3 will replace the AH-1Z and UH-1Y. FVL will be designed for optimal manning and for manned-unmanned teaming (MUM-T) with the MAGTF Unmanned Expeditionary (MUX) capability. Additionally, FVL will include a common mission system architecture to enable interoperability across the MAGTF.

The Marine Corps' driving requirement is attached escort in tomorrow's battlespace during distributed expeditionary operations from the sea. Speed, maneuver envelope, all-weather capability, and survivability will facilitate full integration of this aircraft into the MAGTF. To meet these goals the Marine Corps FVL CS 3 rotorcraft will operate above legacy rotary-wing aircraft performance attributes like airspeeds, combat range, altitude and endurance with a full payload. FVL CS 3 rotorcraft will require a comparable mission radius and loiter time to match MV-22B; time on station to support distributed ACE operations; and G-force limitations and service ceilings higher than legacy rotary-wing airframes.

The FVL CS 3 rotorcraft will have a greater capability to employ a more diverse set of weapon systems and operate in a larger spectrum of environments by using fused on board sensor data and terrain avoidance systems. Amphibious operations and shipboard compatibility will be a key attribute to this air vehicle.

The Marine Corps' FVL Analysis of Alternatives (AoA) will conclude this year. The data generated from this event will lay the groundwork needed to enter the joint trade's analysis and create the service-specific Capability Development Document.

CH-53E AND K (HMH) PLAN

VALUE TO THE MAGTF

The CH-53E Super Stallion entered service in 1981 and is the **only heavy lift helicopter** in the DoD rotorcraft inventory. The current force of eight active component HMHs and one reserve component HMH(-) has supported heavy lift assault support operations across the globe. This ship-to-shore vertical connector routinely transports loads in excess of four and one-half tons out to 110 nautical miles, providing the MAGTF and joint force with the ability to quickly mass combat power. Additionally, the Super Stallion's heavy lift capability, combined with its global amphibious presence, has made it an indispensable strategic asset when responding to both regional hot spots and humanitarian assistance alike.

The CH-53K "King Stallion" is an optimized vertical, heavy lift, sea-based, long range solution for the MAGTF and will immediately provide three times the lift capability of its predecessor. It will be the only fully-marinated, heavy-lift helicopter capable of transporting one hundred percent of the vertical MAGTF. It also boasts a wider cabin than its predecessor and internally carry a HMMMV, as well as the large TRANSCOM 463L pallets. The new external cargo system is comprised of three independent hooks which enable single-, dual- and triple-load operations. This expanded capability facilitates the distribution of three different loads to three different locations while executing one sortie. The most notable attribute of the King Stallion is its ability to maintain increased performance margins in a degraded aeronautical environment (**e.g. High: 3000' / Hot: 95°F / Heavy: 27,000 pounds out to 110 NM**). This translates to any of the following load configurations: 2 x armored HMMWVs, 2 x ECVs, or a JLTV.

The increased heavy lift capability of the CH-53K is unprecedented within MAGTF and joint force and empowers the Marine Corps function as the "contact" and "blunt" layer within the National Defense Strategy.

Planners and decision makers will embrace a new era of capability that allows the quick massing of combat power, agile maneuver, resilient logistics and predictive maintenance, all under the unifying theme of multi-domain attack.

MISSION STATEMENT

Support the MAGTF commander by providing assault support transport of heavy equipment, combat troops, and supplies, day or night, under all weather conditions during expeditionary, joint, or combined operations.



CH-53E AND K (HMH) PLAN

CH-53 INDEPENDENT READINESS REVIEW

In response to readiness challenges in the CH-53E community, the USMC chartered the Super Stallion Independent Readiness Review (SSIRR). This assessment was conducted by a team of senior functional area experts. This team's scrutiny of the CH-53E fleet's material condition, maintenance practices, operations, and logistical support identified various issues and gaps. Root cause analysis further refined the team's findings and developed courses of action to achieve and maintain T-2.0 through Full Operational Capability (FOC) of the CH-53K in 2029.

The SSIRR recovery plan has multiple lines of effort, with the largest's being reset of the entire CH-53E aircraft fleet. Approximately 33% of the fleet has been reset, with another 10% in flow: this is a quarter of the fleet all told. Results include decreased maintenance man hours per flight hour, reduction in cost per flight hour, a stimulated and more responsive supply chain and, most notably, a higher state of readiness for the reset fleet. Reset aircraft have flown more than 9200 hours to date, enabling greater average flight hours per pilot per month and higher T-ratings.

Remaining sustainment efforts reinforce the scope and expenditures of reset; their significance and results cannot be understated. From IMRL/SE procurement to standardizing functional check flight training, every line of effort has contributed to moving the readiness needle. The increased allocation of Portable Electronic Maintenance Aids (PEMAs) and the correction of greater than 1600 Technical Publication Discrepancy Reports (TPDRs) has not only economized maintainer time, but also restored confidence in the accuracy of maintenance publications. Resourcing CH-53E Program Related Logistics (PRL) to appropriate levels has helped offset/mitigate issues associated with this aging airframe. Finally, the addition of Performance Based Logistics (PBL) Phase II will result in Sikorsky's incrementally adding 54 components to D/I/O-Level shelves and incentivizing supply responsiveness.



CH-53E AND K (HMH) PLAN

CAPABILITIES: CH-53K

The CH-53K King Stallion is currently in developmental test phase and will replace the CH-53E Super Stallion starting in FY22. The physical footprint of the CH-53K is equivalent to the CH-53E while its logistical footprint has been reduced. Other improvements include: modern glass cockpit, fly-by-wire flight controls, efficient 4th generation main rotor blades, and an engine which produces 57% more horsepower with 63% fewer parts relative to its predecessor. The King Stallion's increased capabilities, reliability and ease of maintenance will set a new standard for vertical heavy lift.

Aircraft Specifications

- Empty weight: 43,750 pounds
- Max gross weight: 88,000 pounds
- Useful internal payload: 16,900 pounds
- Useful external payload: 27,000 pounds
- Speed (Cruise/Max): 150kts / 170kts

Configuration

- Payload: 30 passengers, 24 litters, (12) 40"x48" pallets, (2) full 463L Pallets, (5) half 463L pallets
- Armament:(3) GAU-21 .50 cal machine guns
- Network Systems: Link 16, VMF, SATCOM
- ASE: DIRCM, ALE-47, APR-39(D)V2

Mission Profile

- Range/Payload/Conditions: 110nm, 27,000 pound external load, 3000' destination elevation, 95°F OAT

CAPABILITIES: CH-53E

The Super Stallion's heavy lift capability, combined with its global amphibious presence, has made it an indispensable asset when responding to both regional hot spots and humanitarian assistance alike.

Aircraft Specifications

- Empty weight: 37,500 pounds
- Max Gross weight: 73,500 pounds
- Useful internal payload: 13,200 pounds
- Useful external payload: 15,000 pounds
- Speed (cruise/max): 130kts / 150kts

Configuration

- Payload: 30 passengers, 24 litters, (7) 40"x48" pallets
- Armament: (3) GAU-21 .50 cal machine guns
- Network Systems: FBCB2 Blue Force Tracker
- ASE: DIRCM, AAR-47(v)2, ALE-47 DD Pods, APR-39(D)V2

Mission Profile

- Range/Payload/Conditions: 110nm, 9,628 pound external load, 3000' destination elevation, 95°F OAT



CH-53E AND K (HMH) PLAN

ORGANIZATION

Marine Corps CH-53 squadrons are organized to support the specific requirements of the MAGTF. A CH-53 squadron is designed to be task organized and is manned, trained and equipped in the following manner:

- 16-aircraft squadron (1.0) Primary Mission Aircraft Authorization (PMAA)
- 12-aircraft temp squadron (.75) Primary Mission Aircraft Inventory (PMAI)
- 8-aircraft squadron minus (.5)
- 4-aircraft detachment (.25)

A 1.0 squadron is capable of sourcing a .5 and two .25 requirements simultaneously. The current inventory of 142 aircraft is approximately 58 aircraft short of the program's 200 aircraft requirement. This decrement has caused DCA to temporarily reduce tactical squadrons to a .75; this temporary base unit is only capable of supporting a .5 and a .25 requirement simultaneously. It is very important to note that a temp squadron cannot source three .25 requirements simultaneously. Additionally, in the current structure a 1.0 requirement would require the sourcing squadron to be complemented by a .25 detachment from an adjacent unit.

The CH-53K will return the heavy lift community to 16 aircraft per squadron. This will be enabled by the fielding of new CH-53Ks and the capitalization of CH-53E inventory from transitioning squadrons.

Of note, the 200 aircraft program of record is 20 aircraft short of the 220 requirement due to fiscal constraints.

The Marine Corps will procure a total of 200 CH-53Ks in the following squadron beddown:

- 8 active squadrons x 16 CH-53K
- 2 reserve squadron (minus) x 8 CH-53K
- 1 fleet replacement squadron x 21 CH-53K

The Marine Corps will start the CH-53K transition in FY21 with the declaration of IOC. It will take approximately 18 months for each CH-53E squadron to transition. In approximately FY24, the first CH-53K MEU detachment will CHOP and set the initial conditions for sustained CH-53K MEUs. The supportability of this deployment event is driven by aircraft procurement and the ability to sustain CH-53K deployments thereafter. The Okinawa Unit Deployment Program (UDP) and its associated MEU will transition to CH-53K shortly after the CONUS-sourced MEUs are transitioned.

During the CH-53K transition, CH-53E/K personnel will be segregated to the max extent possible. **Once a Marine converts to the CH-53K, that Marine will not go back to the CH-53E.** The only exception to this policy will be VMX-1. For a short time, VMX-1 pilots and maintainers will be dual-series qualified until VMX-1 divests of CH-53E operational test responsibilities.



CH-53E AND K (HMH) PLAN

FRS

The CH-53K Transition Task Force (TTF) utilized lessons learned and best practices from the MV-22 transition. During that transition from the CH-46 to the MV-22, the last HMM scheduled for transition was re-designated as an HMMT and assumed the CH-46 FRS role. These responsibilities were in effect until the demand signal for initial pilot training ceased. The squadron re-designated back to an HMM well prior to its V-22 transition.

Similarly, the **CH-53 FRS will reach a tipping point where the majority of its focus will shift from CH-53E to CH-53K.** To enable this action, a tactical HMH will be required to assume CH-53E FRS responsibilities for the remainder of the transition. These actions will enable maximum CH-53K FRS flexibility while sustaining the legacy FRS production.

MANPOWER

The status of TMS-specific MOSs in the Marine heavy helicopter community continues to be healthy. As with the rest of Marine aviation, however, there are grade disparities that exist within the aircrew and maintainer inventories as a result of the force-shaping tools used during the 202K downsizing.

HQMC Aviation ensures the force structure requirement is accurate in order to provide the correct demand signal to planners and assignments monitors at Manpower and Reserve Affairs.

The Marine Corps' Total Force Structure Management System (TFSMS) and unit tables of organization reflect the majority of the CH-53K transition depicted in the AvPlan. However, HQMC must still find structure for the planned activation of HMH-769(-) in FY26. The CH-53 cell continues to focus on setting proper conditions for the successful transition to the CH-53K, while not increasing overall aviation force structure. HQMC Aviation has several ongoing initiatives to ensure the correct force structure and subsequent inventory is in place to facilitate a smooth transition.

The FY18 MOS Manual establishes the skill designator of 7511 for CH-53K qualified pilots and 6053 for enlisted maintenance personnel and aircrew. As of October 2017, Marines who meet the requirements for the MOS are authorized to add 7511 or 6053 as an additional MOS in the Marine Corps Total Force System. The ability to identify personnel with CH-53K training will inform manpower processes and enable a successful transition by keeping trained personnel in critical billets.

HQMC Aviation is updating the initial force structure laydown for CH-53K stakeholders to ensure the continued accomplishment of developmental and operational testing and officer and enlisted student training. To that end, VMX-1 and HX-21 will have the necessary force structure to achieve the assigned tasks while building the inventory to staff HMHT-302 and HMH-366.

CH-53E AND K (HMH) PLAN

RESERVE INTEGRATION

In FY26, the Reserve Component will re-activate HMH-769 at a location in the western United States to be determined. This will provide the reserve component with two HMH(-)s, one on each coast. HMH-769 will also assume CH-53E CAT IV (refresher training) once CAT I-III requirement no longer exists. These two reserve squadrons will be capable of providing GFM relief for active component squadrons executing the CH-53K transition.

Marine reserve integration of the CH-53K begins in FY22 when HMH-772 (-) returns to its full complement of CH-53E aircraft and eventually transitions to the CH-53K in FY29.

The CH-53K transition will be complete with the final 4MAW squadron (HMH-769) transitioning in FY32.



CH-53E AND K (HMH) PLAN

INITIATIVES AND WAY AHEAD

The five year horizon for the CH-53 community includes:

- 1) Continued execution of the CH-53E readiness recovery and sustainment plans.
- 2) Installation of Smart Multifunction Color Display (SMFCD) kits with the Brown Out Symbology Set (BOSS).
- 3) IOC of the first CH-53K detachment, subsequent initial transition of the first tactical squadron and FRS, and initial MEU CHOP in FY24
- 4) Complete reset of the entire CH-53E fleet of aircraft.
- 5) Software Reprogrammable Payload (SRP) with LINK 16.
- 6) Initial return to 16 aircraft squadrons (PMAA).



UPGRADES

Mode V IFF in FY20

Embedded SATCOM in FY19

Smart Multifunction Color Display (SMFCD) with Brown Out Symbology Set (BOSS) in FY19

APX-123 for ADSB-out FAA mandate in FY20

DVE Phases II and III

ASE/SURVIVABILITY

Hostile Fire Indication (HFI)

Advanced Threat Warner/Missile Warner/Laser Warner

Integrated Aircraft Survivability Equipment (ASE)

APR-39 D(V)2

INTEROPERABILITY

Software Reprogrammable Payload (SRP) radio replacement LINK 16

RELIABILITY

New T64 core engines and fuel controls FY21

419 Engine Upgrade FY20

Prognostic/Diagnostic Based Maintenance FY19

Engine Nacelles FY21

Kapton Wiring II and III Replacement (completed FY18)

CURRENT FORCE:

8 AC SQDN x 12 CH-53E
 1 RC SQDN x 6 CH-53E
 1 FRS SQDN x 12 CH-53E

CH-53E AND K (HMH) PLAN

FORCE GOAL:

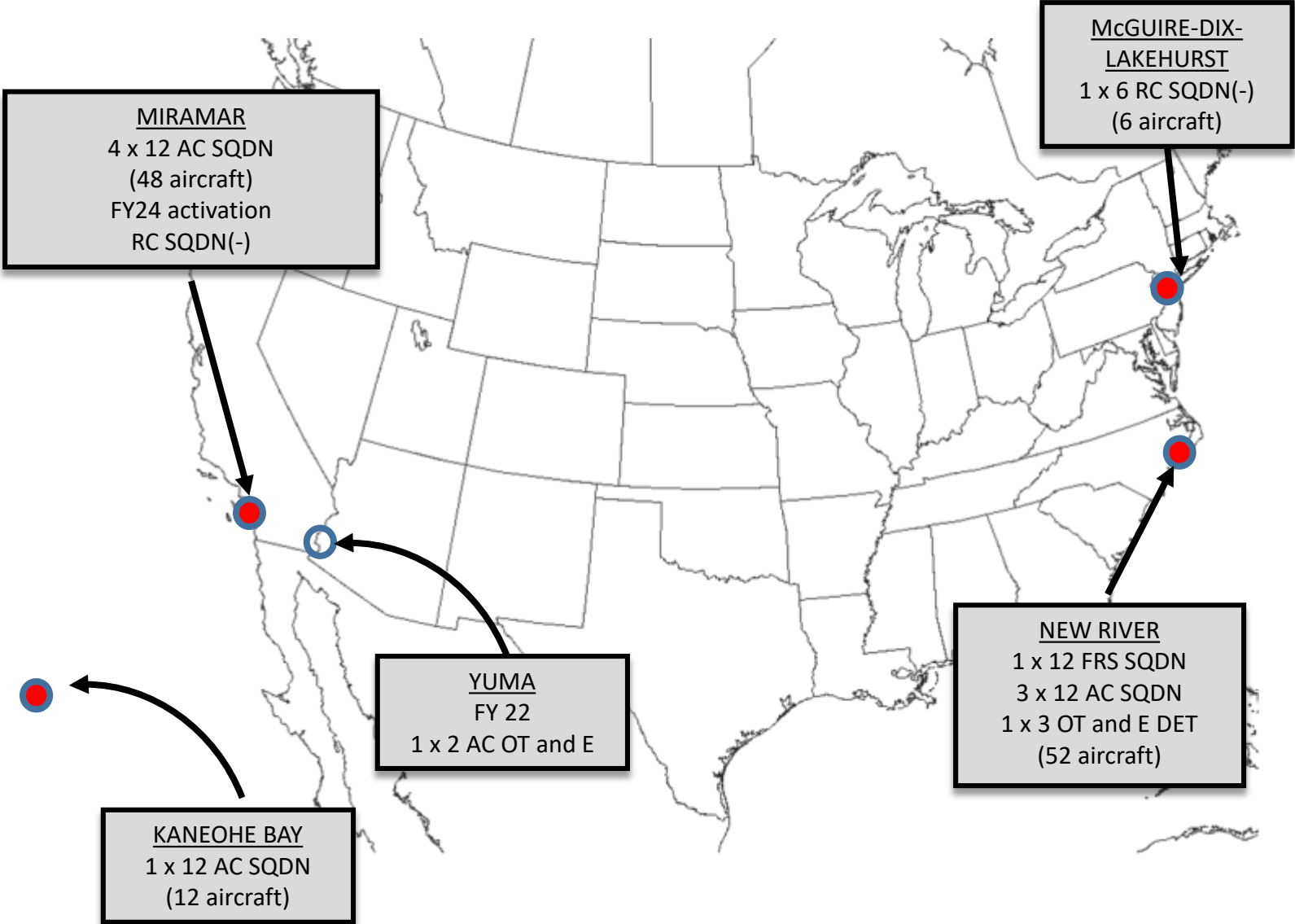
8 AC SQDN x 16 CH-53K
 2 RC SQDN(-) x 8 CH-53K
 1 FRS SQDN x 21 CH-53K

		FY19				FY20				FY21				FY22				FY23				FY24				FY25				FY26				FY27				FY28				FY29			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
2MAW / MAG-29 New River																																													
VMX-1 H-53 DET	2 CH-53E									(1)				(5)																															
HMHT-302	12 CH-53E									(2)																																			
HMH-366	12 CH-53E											(4)				(6)																													
HMH-461	12 CH-53E													16 CH-53E																															
HMH-464 / HMHT-464	12 CH-53E									HMHT (3)*				16 CH-53E																HMH (8)								(9)							
1MAW / MAG-24 Kaneohe Bay																																													
HMH-463	12 CH-53E													16 CH-53E																															
3MAW / MAG-16 Miramar																																													
HMH-361	12 CH-53E													16 CH-53E																															
HMH-462	12 CH-53E													16 CH-53E																															
HMH-465	12 CH-53E													16 CH-53E																															
HMH-466	12 CH-53E																	16 CH-53E																											
MAG-41 TBD																																													
HMH-769 (-)	8 CH-53E																													(7)															
MAG-49 Joint Base McGuire-Dix-Lakehurst																																													
HMH-772 (-)	6 CH-53E																	8 CH-53E																											
MCAS YUMA																																													
VMX-1																																													
TOTAL CH-53E INVENTORY = 142 CH-53K POR = 200 (220 REQ)																																													
* The re-designation of a tactical HMH to an FRS is predecisional pending DOTMLPF (a 2MAW HMH is currently being considered)																																													

NOTES:

- | | |
|---|--|
| 1) VMX-1 Detachment CH-53K IOT&E Training and IOT&E | 5) VMX-1 Detachment PCS to MCAS Yuma |
| 2) HMHT-302 initial CH-53K conversion training | 6) First HMH transition complete and available to support GFMP |
| 3) 2MAW HMH re-designates HMHT&Relieves HMHT-302 of CH-53E FRS responsibility | 7) HMH-769(-) Activation, location TBD |
| 4) Initial Operational Capability (IOC), first HMH starts transition | 8) CH-53E FRS requirement ceases and HMHT re-designated to HMH |
| | 9) CH-53K Full Operational Capability (FOC) |

CH-53E SUPER STALLION AND CH-53K KING STALLION (HMH) PLAN



CH-53E AND K (HMH) PLAN

DEVELOPMENTAL TEST

Ongoing efforts include:

CH-53E: #2 Engine Bay Overheat Detection, HUD upgrades, SMFCD, PDBM, DVE Phase II.

CH-53K:

- 1) GTV- live fire test and evaluation.
- 2) EDMs- envelope expansion, Survey and Qualification Demonstration, Shipboard testing, air-to-air Refueling, Technical evaluation, REV2D (deferred capabilities testing) and P3I (what are the capabilities and what is required to be added).
- 3) SDTAs- Survey and Qualification Demonstration, C-5 load, logistics demonstration at VMX, E-Cubed, IOT and E.



OPERATIONAL TEST AND EVALUATION

Ongoing efforts include:

CH-53E: #2 Engine Bay Overheat Detection, HUD upgrades, SMFCD, PDBM, ALE-47/AAR-47 DIRCM, Digital Interoperability.

CH-53K (STDAs Only):

- 1) Initial Operational Test and Evaluation
 - MCAS New River- confined area landings, extended range deployment, and simulator evaluation.
 - MCAS Yuma (Dirt Det)- external cargo resupply, combat troop insertion, confined area landings, defensive maneuvering, TRAP, raid and extended range deployment.
 - USS Ship- expeditionary external cargo movement, expeditionary internal payload movement, combat cargo insertion, and sortie generation rate demonstration.
- 2) Follow-on test and evaluation
 - REV2D
 - P3I
 - Digital Interoperability
 - DVE Phase III

UNMANNED AIRCRAFT SYSTEMS (VMU) PLAN

RQ-21A BLACKJACK

The RQ-21A system is a Group 3 UAS system that uses a rail-launched, Sky Hook Recovery System (SRS) to launch and recover its aircraft. Each system consists of five aircraft, one launcher, one SRS, 2 Integrated Trailer-ECU-Generator (ITEG), associated support equipment and 4 HMMVS. The RQ-21A is the USMC Group 3 program of record and primarily supports the MEU as well as major service exercises (ITX, WTI). The RQ-21A program will reach full operational capability in FY19. To date, the RQ-21 has flown over 8,700 hours, much of which has been in support of deployed forces on the MEU and in CENTCOM.

Combat radius – Greater than 50 nautical miles

Extended operational range (employing a “hub and spoke”) is 50-100 nautical miles

Payload – EO/IR/IR Marker/Laser range finder

Twenty-five pound useful load (fuel and payload)

Automated Identification System (AIS)

UPGRADES

- 1) Bandwith Efficient Common Data Link (BE-CDL) (2019)
- 2) V3 engine upgrade (2019)
- 3) EO/IR 5/Laser designator (2019)

DEVELOPMENTAL AND OPERATIONAL TEST AND EVALUATION

- 1) SIGINT payload
- 2) SAR/GMTI payload
- 3) EO/IR5 (Laser Designator)

FUTURE INITIATIVES

- 1) BLOS
- 2) Vertical takeoff and landing (VTOL) kit
- 3) Bandwith Efficient Common Data Link
- 4) Portable Ground Control Station



UNMANNED AIRCRAFT SYSTEMS (VMU) PLAN

SMALL UNIT REMOTE SCOUTING SYSTEM (SURSS) / SMALL UAS (SUAS)

The aim of USMC SURSS Family of SUAS (FoSUAS) is to equip the **regiment, battalion, and below with an organic, airborne battlespace awareness capability**. SURSS are man-portable, ruggedized, simple to operate, and give small unit leaders the direct means to build and enhance decision speed and space before the pivot point.

The Marine Corps Force 2025 has increased the Approved Acquisition Objective (AAO) of SURSS FoSUAS. The current SURSS FoSUAS consists of RQ-20A Puma after directed divesture of RQ-11B Raven and RQ-12A Wasp. In addition, Field User Evaluation (FUE) systems such as VTOL, micro and nano SUAS, will complement the capabilities of the FoSUAS in areas where vertical obstructions or confined operations create unique challenges.

As advancements in SUAS technology begin to outpace procurement and fielding of the most up-to-date, and relevant systems. HQMC aviation, working with CD and I, FAA, Marine Corps installations, MARSOC, and PMA-263, will focus on identifying innovative DOTMLPF-C approaches to eliminate friction points and streamline policy and training initiatives to meet burgeoning requirements. In the future we are looking to organize the FoSUAS requirements with the implementation of a 7 category capability set model that will replace the current platform specific models.

The SURSS program manager (PM) at the MEFs track distribution among all subordinate units. I, II and III MEF systems are warehoused and maintained at the Training And Logistic Support Activity (TALSA), West, East and newly established PAC, located aboard Camps Pendleton, Lejeune and MCB Kaneohe Bay, respectively. In the context of system issue, parts supply, and I-level maintenance repair, the TALSA's role is similar to what an armory performs with the additional function of providing platform-specific training and

instructor-operator qualification and certification for the additional MOS of 8623 (SURSS operator).

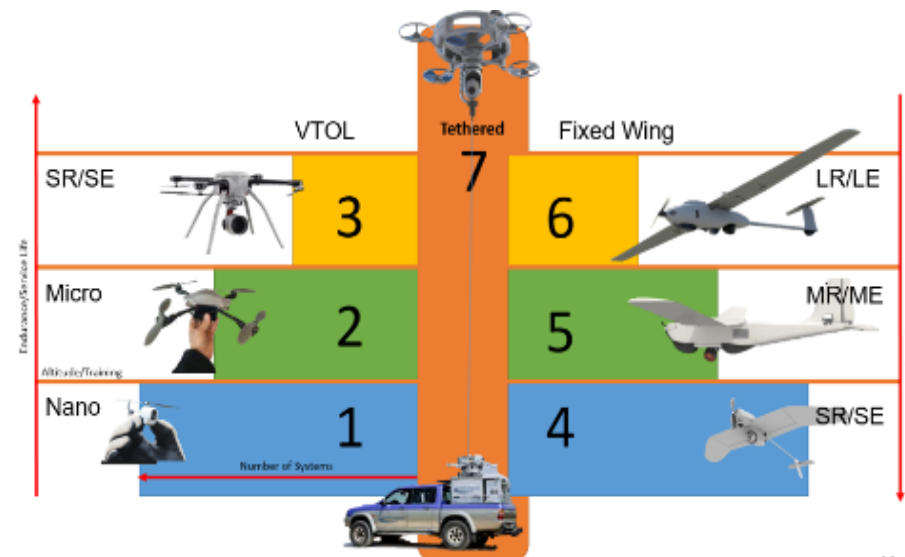
SURSS/SUAS 7 CAPABILITY SET MODEL

VTOL

- 1) Nano
- 2) Micro
- 3) Short Range/
Short Endurance

Fixed-wing

- 4) Short Range/
Short Endurance
- 5) Medium Range/
Medium Endurance
- 6) Short Range/
Short Endurance
- 7) Tethered



UNMANNED AIRCRAFT SYSTEMS (VMU) PLAN

OCONUS GROUP 5 SUPPORT

The Marine Corps is utilizing a Contractor Owned/Contractor Operated (CO/CO) MQ-9A Block V Reaper system to fulfill an urgent needs request for persistent ISR. This support will not only provide needed support forward but will also serve as a proof of concept for USMC Group 5 ISR. The COCO contract operates a single orbit per ATO capable of 24-hour coverage seven days a week.

The MQ-9 is launched and recovered OCONUS, operated by contractors with USMC mission commanders in CONUS, which is referred to as Remote Split Operations (RSO).

The Marine Corps is planning to transition to a Government Owned/Government Operated (GO/GO) MQ-9 capability to support an urgent need for Persistent Strike capability. The GOGO concept will have Marines operating the Reaper aircraft via RSO with contract maintenance and launch/recovery support OCONUS. This increased capability, which fulfills the CMC's directive for USMC Group 5 persistent ISR with strike, will be IOC by FY21.

The MQ-9 COCO and GOGO support will provide crucial information, lessons learned, requirements, and TTPs that will aid in the USMC efforts for a successful acquisition and fielding of the MUX.



UNMANNED AIRCRAFT SYSTEMS (VMU) PLAN



MAGTF UNMANNED EXPEDITIONARY CAPABILITIES (MUX) ICD MEF/MEB LEVEL SUPPORT

Recognizing our current recapitalization toward a more diverse, lethal, amphibious and middleweight expeditionary force, the Marine Corps requires a UAS that is network-enabled, digitally interoperable, and built to execute responsive, persistent, lethal, and adaptive full-spectrum operations.

In accordance with the Department of Defense Unmanned Systems Integrated Roadmap (FY2013-2038), the Marine Corps will seek opportunities to achieve affordable and cost-effective technical solutions for MUX. The concept of employment will be shipboard capable and expeditionary **MUX will be multi-sensor and will provide early warning, electronic warfare, a C4 bridge, ISR, strike capability and logistics at ranges complementary to those of MV-22 and F-35, giving MAGTF commanders flexible, persistent, and lethal reach.** It

will provide scalable MAGTF support deploying as detachments or squadrons supporting commanders at the tactical, operational, and strategic levels.

MUX is envisioned as a USMC program of record based on leveraging technology maturation of programs and industry prototypes. Marine aviation will continue to pursue opportunities to inform programmatic decisions, such as field users' evaluations, science and technology projects, and tactical demonstrations (TACDEMOS) in conjunction with large force exercises (LFE).

In addition, the Marine Corps owns two Kaman KMAX CQ-24 UAS - currently assigned to VMX-1 - to expand the cargo UAS envelope, refine MUX experimentation, reduce risk, and capitalize on lessons learned from the AACUS program.

UNMANNED AIRCRAFT SYSTEMS (VMU) PLAN

UNMANNED LOGISTICS SYSTEMS - AIR (ULS-A)

ULS-A provide logistics and ground units with their own organic, highly autonomous, unmanned aerial logistics systems that reduce risk, while increasing flexibility and speed of delivery to small units at the last tactical mile. ULS-A provide:

- Simplicity – Any Marine can utilize ULS with limited or no instruction
- Reliability – Systems function and operate with minimal maintenance
- Visibility – Integrate C2 capabilities for in transit awareness and asset tracking

ULS-A is a family of systems sized for appropriate levels of the MAGTF needs.

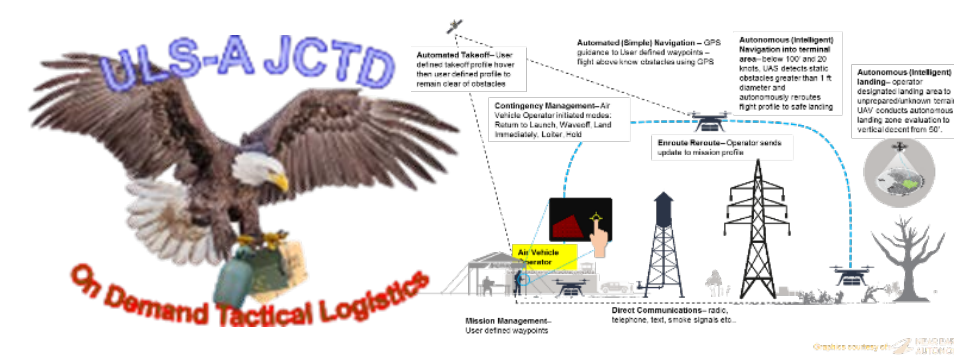
SMALL ULS-A

Provide sustainment out to squads and teams. In program development and funded in the budget. Target IOC ~ 2023.



MEDIUM ULS-A

Provide sustainment out to platoon sized elements. In development as part of a Joint Capability Technology Demonstration with the US Army. MCWL lead effort informs program of record development with estimated IOC of 2025.

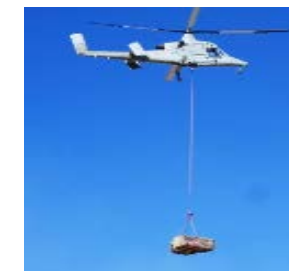
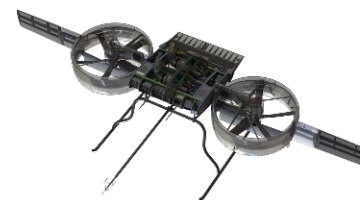
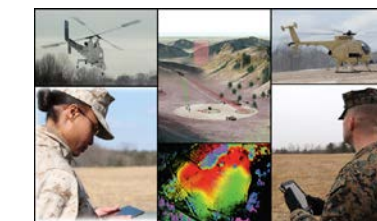


LARGE ULS-A:

Provide sustainment out to company sized elements. Efforts ongoing to inform a future program:

Autonomous Aerial Cargo Utility System (AACUS) – develops advanced autonomous capabilities for improved utility of unmanned systems.

KMAX UAS. Marine Corps deployed 2 systems between 2011 and 2014 to Afghanistan. Systems may be required again to meet urgent needs.



UNMANNED AIRCRAFT SYSTEMS (VMU) PLAN

UAS PAYLOADS

Acquisition paths for payloads will be defined by three phases, each marked by a decision gate. **Phase I** establishes the preliminary integration design concept and conduct of technology demonstration with validation of a Technology Readiness Level (TRL) 5/6. **Phase II** establishes full payload-to-UAS integration and achievement of TRL 7 or higher constitute the decision gate for Phase III. **Phase III** is program of record transition, which supports a production decision based on the exit criteria from Phase II.

TACTICAL ISR PROCESSING, EXPLOITATION, AND DISSEMINATION SYSTEM (TIPS) BLOCK 3

A key enabler for realizing the full capability of the regimental to MEF level family of UAS is TIPS Block 3. TIPS Block 3 will fuse information collected from the unmanned aircraft with information from other off board data systems. It will allow the UAS operator to control the aircraft while fusing, displaying, and disseminating common operational picture data starting with Link 16, Simplified Electronic Warfare System Interface (SEWSI), Raptor-X, full-motion video, and other software applications. The ability to **display friendly, enemy units, aircraft, targets, and signals of interest to users from the squad to MEF level** will be an instrumental definition of this system. All of the above listed kill-chain, digitally interoperable, and battle space awareness applications are critical to the MAGTF commander's ability to influence the electromagnetic spectrum, integrate fires, maneuver, and shorten kill chains. TIPS Block 3 will be the interface for the fusion. Additionally, TIPS Block 3 will significantly augment the ability of the VMU to efficiently execute the task, collect, process, exploit, and disseminate (TCPED) cycle.

As the number and capability of airborne sensors on the battlefield increases, so will the amount of data we collect. TIPS Block 3 will act as a digitally interoperable hub for the collection, cataloguing and storage of full motion video, multi-intelligence sensor data, topological data, and target information. TIPS Block 3 will be able to measure the available bandwidth and determine the optimal means to disseminate intelligence products.

Future iterations of TIPS Block 3 will use advanced algorithms to analyze the vast amount of data as it is collected and autonomously cue operators to defined areas of interest. TIPS Block 3 completes the full capability of the digitally interoperable VMU. Incorporating TIPS Block 3 into a program of record is an imperative for the UAS community. Headquarters Marine Corps Aviation is working with PMA-263, PMA-234, and C2CEWID for this requirement.

FOR SIGINT (SPECTRAL BAT)

In FY19 we will complete Phase 4 SIGINT effort and will make the POR transition which will create a SIGINT/ES capability for the VMU.

FOR RADAR (SPLIT ACES)

In FY19 we will be conducting development and operational test on AESA RADAR payloads for RQ-21. The RQ-21 Split Aces capability is being planned to IOC in the 2nd quarter of FY19.

OTHERS

In FY19 we will continue working on a Wide Area Persistence Surveillance capability. These are POM-19 efforts for the USMC but are currently being supported by the Office of Naval Research.

UNMANNED AIRCRAFT SYSTEMS (VMU) PLAN

ORGANIZATION

The VMUs operate and maintain Group 3 UAS.

The realignment of VMUs from the Marine Aircraft Control Group (MACG) to the Marine Aircraft Group (MAG) was completed in 2015. This command structure aligns the VMU community with manned aviation units and enables a seamless relationship with the Marine Aviation Logistics Squadrons (MALS).

Marine aviation has located each active component VMU aboard a Marine Corps Air Station which has facilitated UAS fielding and has provided the necessary infrastructure for the VMUs to establish habitual relations with MALS and their Group headquarters.

In January 2016, VMU-2 successfully completed an Operational Readiness Inspection (ORI) and was declared Initial Operations Capable (IOC) in the RQ-21A Blackjack system. Since this time, VMU-2 has achieved Full Operational Capability (FOC) with 6 RQ-21 systems. VMU-1 has fielded 6 RQ-21 systems and is FOC. VMU-4 will complete full squadron transition of 2 RQ-21 systems in 2019. VMU-3 will accept delivery of its first system of RQ-21 in the first quarter of FY2019 and complete full squadron transition by 2020.

Changes :

VMU-1 will establish an MQ-9 detachment to support MQ-9 operations at Yuma, COCO first evolving to GOGO.

Squadron	Marine Aircraft Group	Air Station
VMU-1	MAG-13 (RQ-21/MQ-9)	MCAS Yuma, AZ
VMU-2	MAG-14 (RQ-21)	MCAS Cherry Point, NC
VMU-3	MAG-24 (RQ-21)	MCAS Kaneohe Bay, HI
VMU-4 (-)	MAG-41 (RQ-21)	Camp Pendleton, CA
VMX-1	(RQ-21 / CQ-24)	MCAS Yuma, AZ
VMUT (FRD)	MAG-14 (RQ-21)	MCAS Cherry Point, NC

UNMANNED AIRCRAFT SYSTEMS (VMU) PLAN

FRS

The RQ-21 FRD is preparing to achieve IOC in the 2nd quarter of FY19 by standing up capabilities to conduct critical MOS and fleet replacement training activities at MCAS Cherry Point.

The FRD will fall under MAG-14/2nd MAW and will house two different curricula to include a UAS Operator Common Core course of instruction for the enlisted UAS operators (7314) as well as 1000-level fleet replacement instruction for both the 7314 and 7315 MOSs.

The FRD will aim to reach FOC in the 1st quarter of FY20 by completing its planned annual throughput and ultimately providing the fleet with highly trained crews to meet the robust demand for organic unmanned ISR.

MANPOWER

Future Force 2025 reduction of 350 pieces of VMU structure creates manning limits for MEU detachments. Redefining VMU RQ-21 Det structure to 15-17 Marines allows better efficiencies and the opportunity to source initial MQ-9 operations of one-cap from within the VMU while also aligning the VMU Det capability with other ACE T/M/S Dets.

Group 5 USMC GOGO with one line of support per ATO will require a minimum of 24 Marines (12 pilots and 12 sensor operators) who will require additional training for approximately two years with the USAF.

7314 and 7315 MOSs are in increasing demand as the service integrates and expands unmanned aviation technology at the tactical level. FAC tour assignments, augmentation tours with MARSOC, key staff positions at all levels from within both fleet and support commands shows the demand and flexibility of UAS professionals.

SUSTAINMENT

Current inventory of the RQ-21 Blackjack consists of 21 systems, which completes the RQ-21 procurement. MSD was successfully implemented 1 Oct 2018 with full system fielding by the end of 2nd quarter FY19. **Major increases for parts allowances, expansion of composite level repair, as well as in increase in organizational and intermediate-level repairs have bolstered RQ-21 readiness.**

The RQ-21 is scheduled to reach FOC in 2019 and the support base is maturing in parallel. Teamwork and partnerships with the OEM, PMA, and HQMC are actively working to address both the depth and breadth of spares for the platform. As the RQ-21 continues to deploy on MEUs as well as expeditionary detachments, the supporting logistical and supply system will normalize and grow respectively. In addition, depot level repairs will expand to both organic and contractor activities that will expedite critical non-RFI parts back to the fleet.

The RQ-21 moved into the BISOG funding line in FY19. This aligned efforts of HQMC, PMA, and the fleet with best practices of the Marine aviation community.

The fleet and the program office are working efforts to get maintenance actions done as locally as possible. This includes deliberate efforts to do composite repair at the I-level as well as dedicated experimentation and effort exploring the use of 3D printing for both critical and non-critical aeronautical components.

RESERVE INTEGRATION

VMU-4 (-) transitioned to the RQ-21A in FY18 to provide operational depth for this high demand / low density asset.

UNMANNED AIRCRAFT SYSTEMS (VMU) PLAN

CURRENT FORCE PAA:

1 AC VMU SQDN x 6 RQ-21A
 1 AC VMU SQDN x 6 RQ-21A
 1 AC VMU SQDN x 4 RQ-21A
 1 RC VMU SQDN x 2 RQ-21A

FORCE GOAL PAA:

2 AC VMU SQDN x 6 RQ-21A
 1 AC VMU SQDN x 4 RQ-21A
 1 AC FRD SQDN x 1 RQ-21A
 1 RC VMU SQDN x 2 RQ-21A

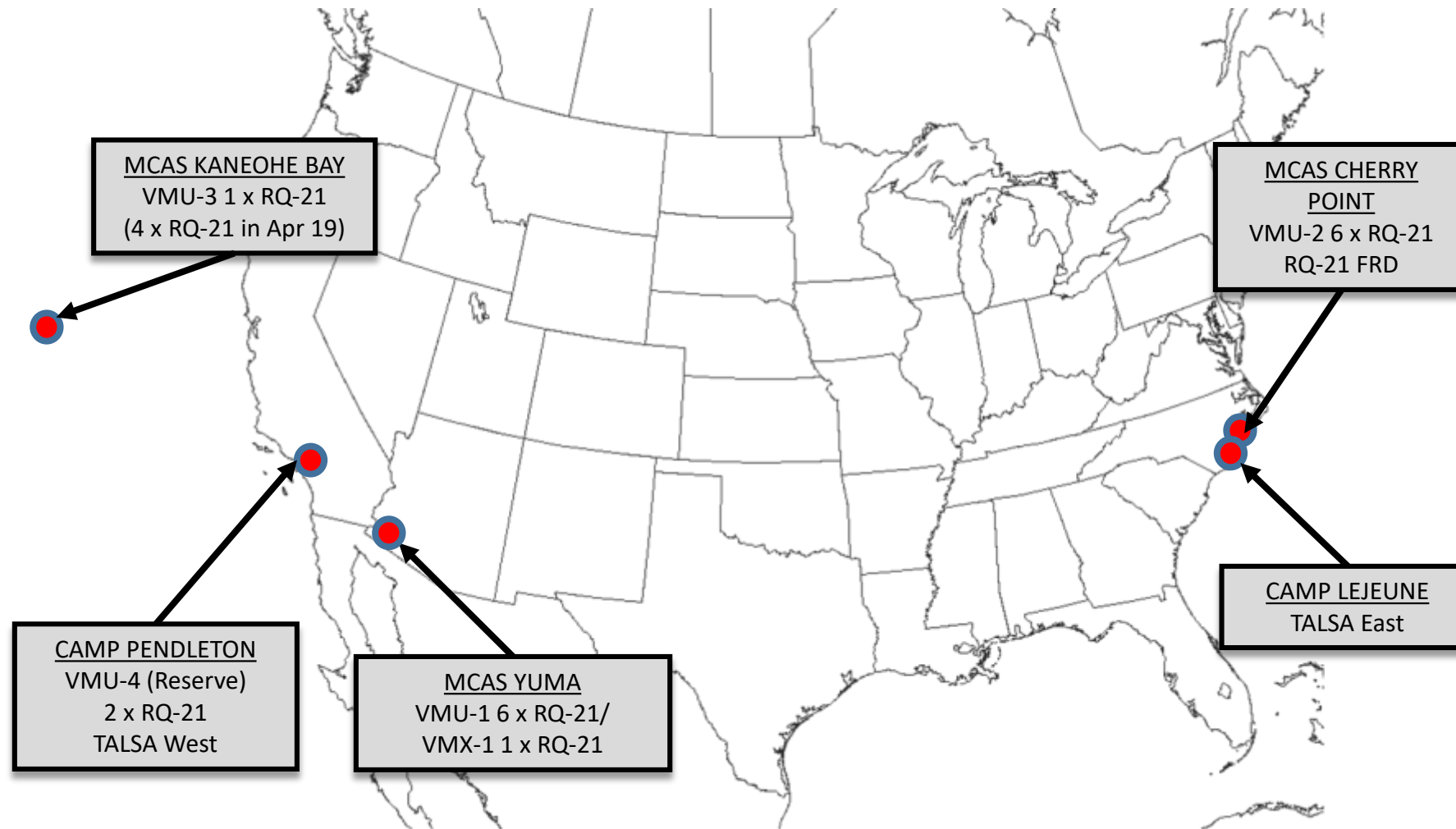
		FY19				FY20				FY21				FY22				FY23				FY24				FY25				FY26			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
MAG-24 KANEOHE BAY																																	
VMU-3	4 RQ-21A	X	V																														
VMU-2	6 RQ-21A																																
FRD	1 RQ-21A	V																															
MAG-13 YUMA																																	
VMU-1	6 RQ-21A																																
MAG-41 RESERVE COMPONENT CAMP PENDLETON																																	
VMU-4	2 RQ-21A																																
MAG-14 (T/M/S LEAD) YUMA																																	
VMX-1	1 RQ-21A																																
AC/RC/FRD TOTAL UNITS																																	
SYSTEM TOTALS (RQ-21A)																																	

NOTES:

- 1) MAG-14 AND MAG-13 HABITUALLY SUPPORT THREE MEUS EACH.
- 2) MAG-24 WILL HABITUALLY SUPPORT THE 31ST MEU.
- 3) 1X RQ21 SYSTEM TO REMAIN WITH UX-24 AT NAS PAXUTENT RIVER, MD

X = BLACKJACK TRANSITION BEGINS
 Y = FIRST SYSTEM INTRODUCED
 V= TRANSITION COMPLETE

UNMANNED AIRCRAFT SYSTEMS (VMU) PLAN



F-5 (VMFT) PLAN

VALUE TO THE MAGTF

The F-5 N/F provides a professional fixed-wing aggressor training resource for TACAIR, assault support, GBAD, and MACS T&R requirements.

MISSION STATEMENT

Provide safe, professional adversary support to enhance the combat readiness of Marine aviation and ground units. Additionally, support non-USMC units on a not-to-interfere basis.

ORGANIZATION

Current USMC inventory is twelve F-5s that are assigned to VMFT-401 at MCAS Yuma. The program is managed through PMA-226, along with the Navy's 31 F-5s.

Serving as a training asset for the entire MAGTF, as well as the joint force, the F-5 has seen adversary requirements grow significantly over the past thirteen years. As the Marine Corps continues its transition to the F-35, VMFAT-501 pilot training requirements (PTR) will more than double to nearly 1600 required adversary sorties through FY19.

Annual fleet adversary requirements are expected to also increase for transitioning squadrons from 6400 air-to-air sorties in FY17 to 8300 sorties per year in order to meet T2.0 requirements in FY22.

SUSTAINMENT

The F-5 fleet is funded for life-limited components such as upper cockpit longerons, wings, horizontal stabilator pairs, and vertical stabilators that will enable the F-5 to achieve its planned 6000 (F-5F) / 9000 (F-5N) hour life. This extends the Department of the Navy's 43.

Adversary capacity is the greatest issue in Marine Corps air-to-air training, followed closely by range availability and modernization, and training simulator capabilities. VMFT-401 can source up to 3300 sorties per year, restrained by aircraft utilization and numbers of F-5s assigned. Combining A/A requirements for fleet training, FRS production and weapon school support, the USMC builds an adversary requirement of over 10,000 sorties in 2019. Accordingly, the USMC suffers a nearly 7000-sortie capacity gap.

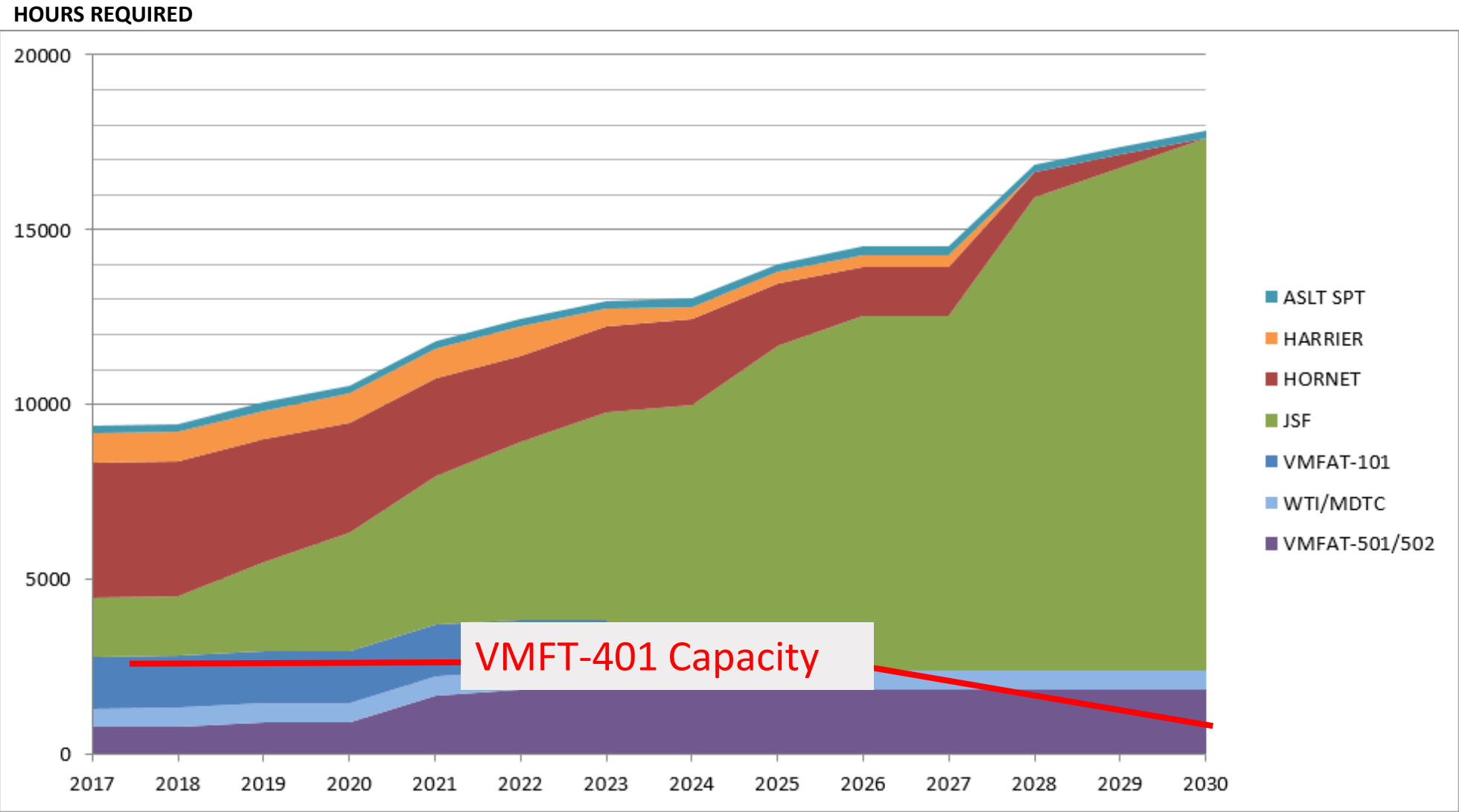
INITIATIVES/WAY AHEAD

A recent upgrade to the F-5 is a red-net data link solution that provides requisite safety and tactical awareness through secure a Commercial Off The Shelf (COTS) kneeboard tablet that has been funded and is fielding. Upgrading EA capabilities in the future is also a priority within the adversary community and Program Office.

Expansion of the F-5 program will continue to be explored in the area of commercial solutions and through efforts with the Navy and Air Force. The long-term solution is dependent on a resourced DoN adversary training study to inform future procurement decisions and an adversary support roadmap.

Near-term analysis is in work to develop a solution for F-35B adversary requirements at MCAS Beaufort, S.C., and includes the possibility of a temporary or permanent adversary footprint. The current F-5 fleet is aging and commercial air service cannot satisfy all the service demands. The future lies in multiple solutions that include using F-5s efficiently for the next 10 years, investing in areas that provide training value at lower cost than aircraft procurement, and commercial air services to augment requirements.

USMC ADVERSARY (AIR-TO-AIR) REQUIREMENTS



OPERATIONAL SUPPORT AIRLIFT (OSA) PLAN

VALUE TO THE MAGTF

Marine Corps operational support airlift (OSA) provides an economical and efficient alternative for the movement of personnel and cargo by reducing the burden that small payloads place on large tactical aircraft. Moving high volumes of small payloads to widely dispersed Marine air-ground task force (MAGTF) elements poses challenges for Marine Corps aviation; OSA relieves this burden.

Marine Corps OSA units perform the same airlift missions whether deployed or at their home stations. Unpredictable, short notice movements are not usually compatible with the United States Transportation Command's and United States Air Force's airlift missions or commercial route structures. This flexibility is vital to MAGTF logistics, communications and security in all phases of deployment.

OSA aircraft make significant contributions in airlift support while operating at a **fraction of the cost** of tactical assault support assets. Two aircraft remain forward deployed ISO SPMAGTF requirements.

MISSION STATEMENT

The mission of Marine Corps OSA is to provide Marine Corps forces and MAGTFs with time-sensitive air transport of high priority passengers and cargo and other critical air logistic support between and within a theater of war, and to otherwise support Marines as directed.

CAPABILITIES

UC-35 C/D

Combat range: 1,960 nm (C) and 1,970 nm (D)
Empty weight : 9,395 pounds (C) and 10,642 pounds (D)
Max gross weight: 16,300 pounds (C) and 16,830 pounds (D)
Payload: 7 passengers
Cruise Speed: 420 KTAS
Defensive Systems: AAR-57 /ALE-47 (D)

UC-12 F/M/W

Combat range: 1,974 nm (F/M) and 2,345 nm (W)
Empty weight : 7,755 pounds (F/M) and 10,200 pounds (W)
Max gross weight: 12,500 pounds (F/M) and 16,500 pounds (W)
Payload: 9 passengers
Cruise speed: 294 KTAS (F/M) and 334 KTAS (W)
Defensive systems: AAR-57 /ALE-47 (W)

C-20 G

Combat Range: 4,220 nm (G)
Empty Weight : 41,820 pounds (G)
Max Gross Weight: 73,200 pounds
Payload: 14-19 passengers
Cruise Speed: 460 KTAS (G)
Defensive Systems: None

OPERATIONAL SUPPORT AIRLIFT (OSA) PLAN

ORGANIZATION

Marine Corps OSA currently operates 28 commercial derivative aircraft in 10 locations CONUS/OCONUS.

- (2) C-20G
- (14) UC-12F/M/W
- (12) UC-35C/D

Additional funding is required for the following:

- (4) UC-12W

The Marine Corps is 60% complete with the UC-12W transition with four FOC squadrons in the fleet. Okinawa, Iwakuni, Miramar and Belle Chasse are complete with the transition, leaving Beaufort, New River and Yuma to complete.

Recently the Marine Corps has:

- Moved VMR-1 (Flag) to Fort Worth
- Started the procurement of follow-on aircraft; timeline is TBD

MANPOWER

OSA operators are from the bases and stations (I and L). Active duty OSA units fall under the H&Ss at local bases and stations (I and L) and are staffed by the station personnel. Within the two Reserve units, the staffing is comprised of active and reserve personnel assigned as VMRs under MAG49.

SUSTAINMENT

Life sustainment of a commercial aircraft derivative is accomplished via NAVAIR. MROC DM 57-2010 is the Marine Corps Operational Support Airlift Master Plan. HQMC Aviation developed the plan to provide the

MAGTF commander with the right mix of aircraft to provide the time sensitive movement of personnel and cargo. It articulates OSA aircraft recapitalization to modernize the fleet to meet current and future needs.

RESERVE INTEGRATION

4th MAW continues to play a pivotal role in the OSA community. With the flexibility and experience base existent within 4th MAW, VMR-1 relocated to NAS JRB Ft Worth and became a 4th MAW unit in FY18. The C-9 aircraft were divested in FY17 and the squadron awaits delivery of follow-on aircraft.



OPERATIONAL SUPPORT AIRLIFT (OSA) PLAN

INITIATIVES AND WAY AHEAD

Procurement of (2) C-40As is in development
- Projected contract award date is late June 2019

UPGRADES

UC-12W Ballast kit for CG assistance (Funded)

UC-12W Increased gross weight kit (Funded)

ASE/SURVIVABILITY

UC-35 TMS ASE Gen 3 upgrade (FY19Q2/Q3)* (Funded)

INTEROPERABILITY

C-20 ADS-B Out version 2; GAC solution available*

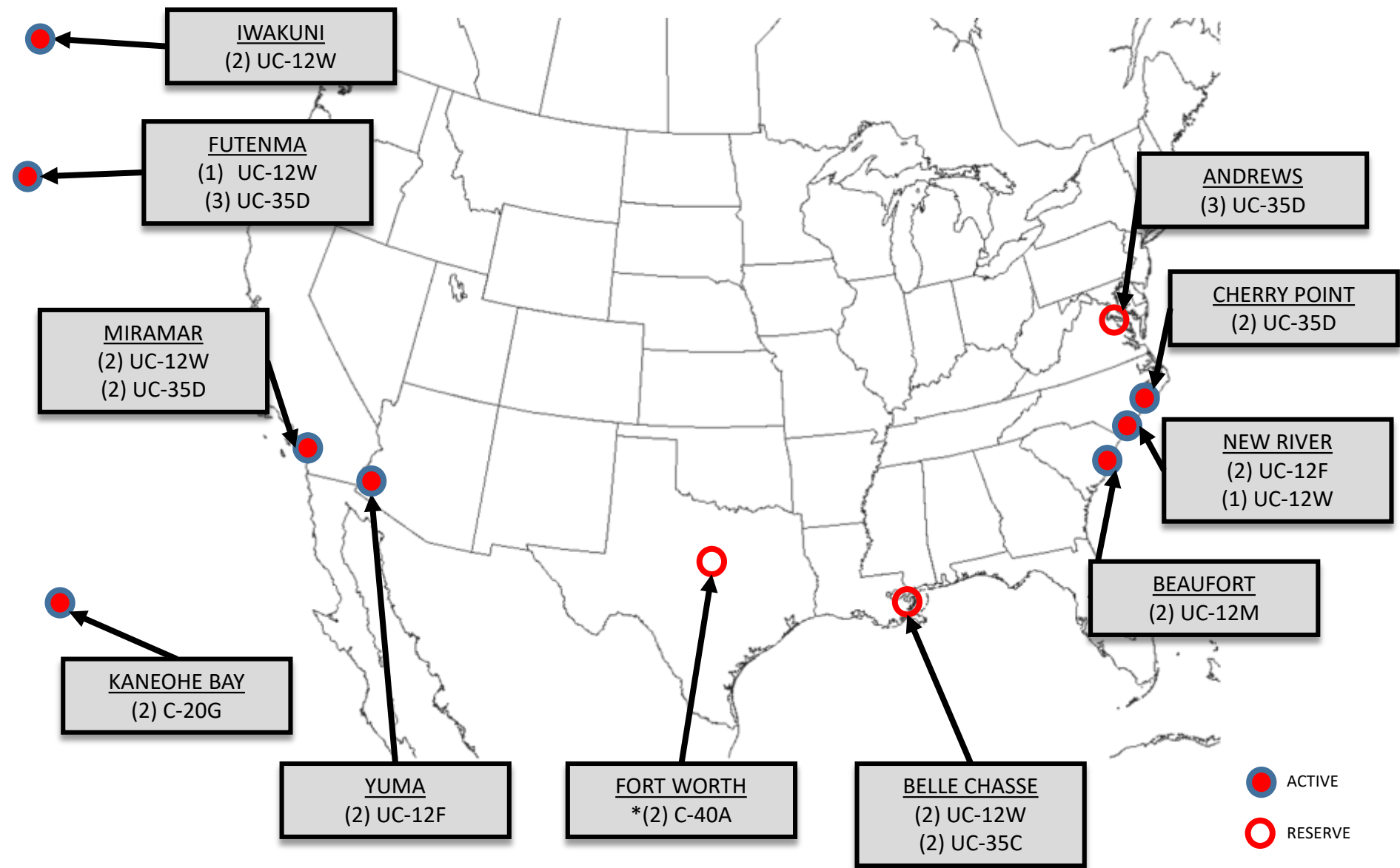
UC-35 ADAP to protect GPS position from intentional jamming approved

UC-35 ADS-B Out (Funded and scheduled to install)

*Install will be planned in accordance with maintenance schedule



OPERATIONAL SUPPORT AIRLIFT (OSA) PLAN



*C-40A delivery late FY 2021.

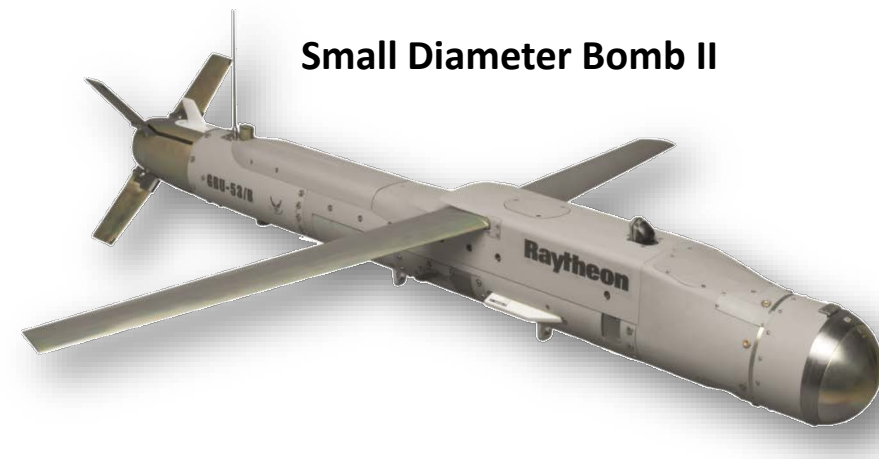
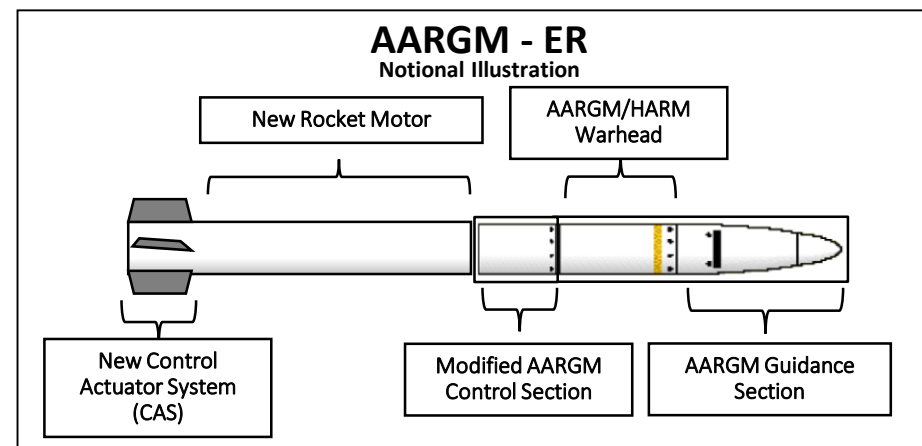
MARINE AVIATION WEAPONS AND MUNITIONS PLAN

AIR-TO-GROUND WEAPONS

As Marine platforms gain capabilities, their lethality is advanced through weapons improvements. Marine aviation weapons are keeping pace with a rapidly evolving threat capability and are on track to counter peer defensive systems, providing the MAGTF its offensive dominance. Key additions to the aviation weapons inventory in the last twelve months include: successful entry of the Joint Air-to-Ground Missile (JAGM) into post-Milestone C low-rate initial production (LRIP); integration of the Advanced Precision Kill Weapon System (APKWS) II on F/A-18C/D; integration of APKWS II equipped with the M282 Multi-Purpose Penetrator (MPP) warhead on AV-8B and H-1s; integration of GBU-49 on F-35B; and full integration of the GAU-21 gun system on every assault support platform.

STAND-OFF AND NET-ENABLED WEAPONS

Advanced Anti-Radiation Guided Missile-Extended Range (AARGM-ER) improves the baseline AARGM Block I by incorporating a new motor and additional technological advancements, resulting in increased



Small Diameter Bomb II

range and missile survivability. AARGM-ER is funded for F/A-18E/F, the threshold platform, and Marine aviation is exploring options to integrate this capability on F-35 and F/A-18C/D.

GBU-53 Small Diameter Bomb (SDB) II is a 250-pound class, net-enabled, gliding precision-guided munition with a tri-mode seeker that uses semi-active laser, millimeter wave, and imaging infrared. SDB II can be employed against stationary or moving targets in day, night, and all-weather conditions. Both F-35B and F-35C will have the ability to internally carry eight SDB II. SDB II is projected to achieve EOC on F-35B in FY21.

AGM-154 Joint Stand-Off Weapon (JSOW) C-1 is an improvement to the baseline JSOW that adds a net-enabled and Moving Maritime Target (MMT) capability. The JSOW-ER (Expanded Range) variant is also under development and will further improve the missile's range and survivability. JSOW C-1 integration is planned for the F-35B (external carriage only) and F-35C (internal and external).

MARINE AVIATION WEAPONS AND MUNITIONS PLAN

STRIKE WEAPONS

GBU-49 is a dual-mode 500-pound direct attack weapon that will serve as a moving target capability bridge until GBU-54 is integrated on the F-35. The Marine Corps capitalized on U.S. Air Force and foreign military service integration of the GBU-49 on F-35B and procured a limited quantity of precision guidance kits in FY18. Those kits delivered in early FY19 and have been distributed to the fleet. Additionally, the Marine Corps continues to convert AGM-65F, Infrared (IR) Maverick, into modernized AGM-65E2, Laser Maverick, to augment the steadily declining Laser Maverick inventory. The AGM-65E2 seeker provides the F/A-18C/D and AV-8B with increased self-designation capability, greater chance of laser spot re-acquisition, and a more accurate laser spot scan than the AGM-65E seeker.



APKWS II was integrated on the F/A-18C/D in early 2018 and subsequently deployed in support of Operation INHERENT RESOLVE. APKWS II is now on every platform capable of carrying 2.75" rockets and continues to prove its distinct advantage over unguided rockets. The addition of the M282 MPP warhead on APKWS II provides a low-cost, guided rocket capable of defeating light-armored vehicles and hardened structures. The M282 MPP is capable of penetrating more

than 40" of reinforced concrete or 1" of steel. It was integrated on AV-8B and H-1s in early 2018 and is anticipated to be integrated on F/A-18C/D within the next calendar year.



The Joint Air-to-Ground Missile (JAGM) program is fully funded, recently passed Milestone C, and is now in its final stage of the acquisition cycle. JAGM will achieve IOC on the AH-1Z in FY20. It incorporates a dual-mode, semi-active laser and millimeter wave seeker with a multi-mode fuze (height of burst, delay, and point detonating). JAGM's multi-purpose warhead provides capabilities of the AGM-114K/M/N warheads and produces highly effective blast-fragmentation. JAGM improves survivability through an increased launch acceptability region and countermeasure resistance. Additionally, the millimeter wave seeker may be activated pre-launch, providing a fire-and-forget capability with high probability of hit in adverse and maritime environments.



MARINE AVIATION WEAPONS AND MUNITIONS PLAN

AIR-TO-AIR MISSILES

Air-to-air missiles continue to evolve and gain new and improved capabilities. The AIM-9X Block II Sidewinder adds a lock-on-after-launch capability with data-link, allowing it to be launched and then guided to a target for 360 degree engagements. The Block II+ variant will be fielded in FY19 to support F-35B/C. The AIM-120 Advanced Medium Range Air-to-Air Missile (AMRAAM) gives a single TACAIR platform the ability to engage multiple targets simultaneously through the use of the missile's active radar for terminal guidance. The AIM-120D variant increases capability through the inclusion of an internal GPS, enhanced two-way data link, improved software, and improved range and speed.

AIM-120D



GUN SYSTEMS

The GAU-21 crew-served weapon system replaced legacy .50 caliber weapons and is now fully fielded on all assault support aircraft. Additionally, HQMC continues to investigate improved 20mm and 25mm ammunition for TACAIR and the AH-1Z in order to provide increased penetration and incendiary effects and decrease dud rates.

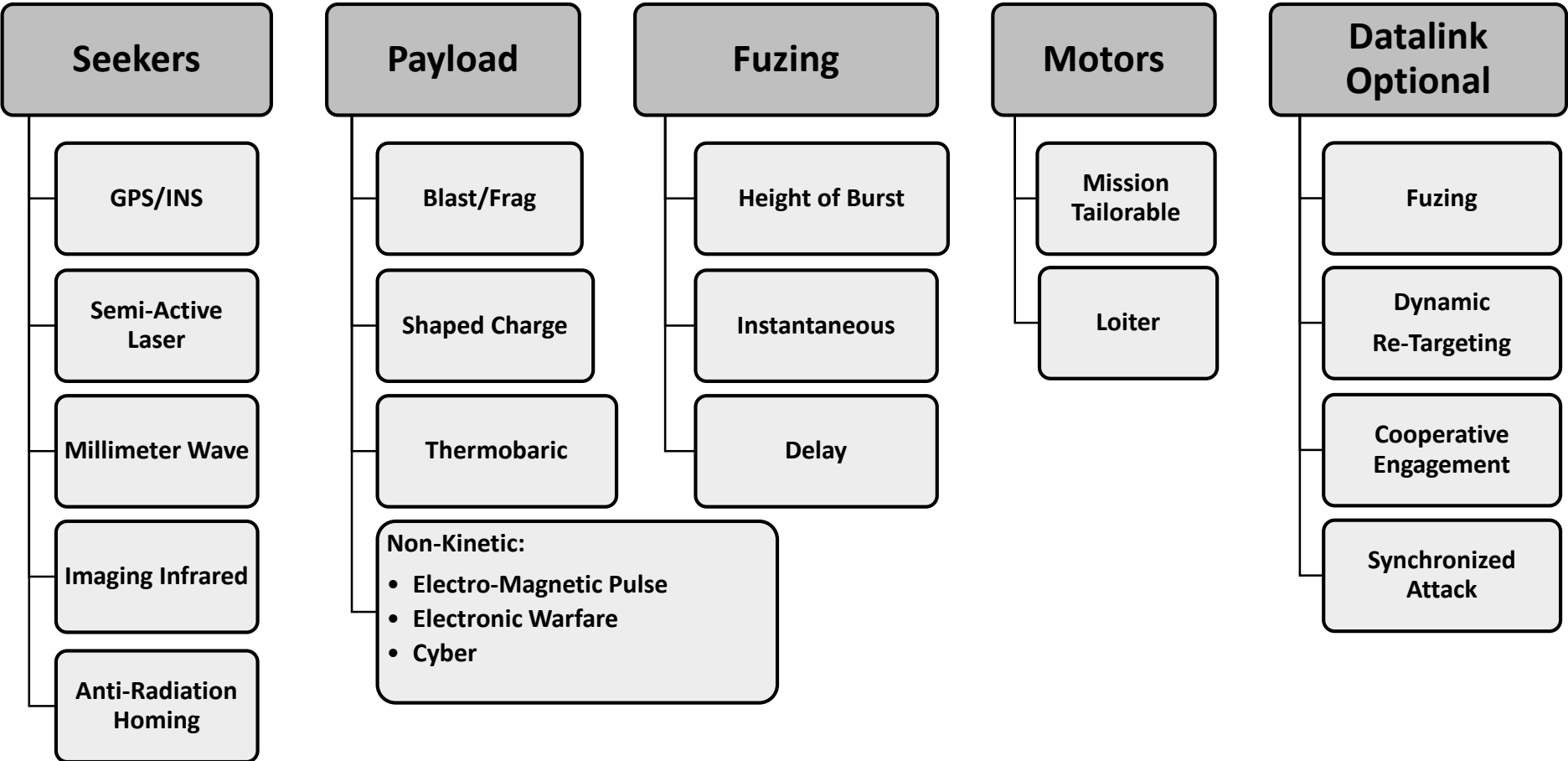


AIM-9X

FUTURE WEAPON SYSTEMS

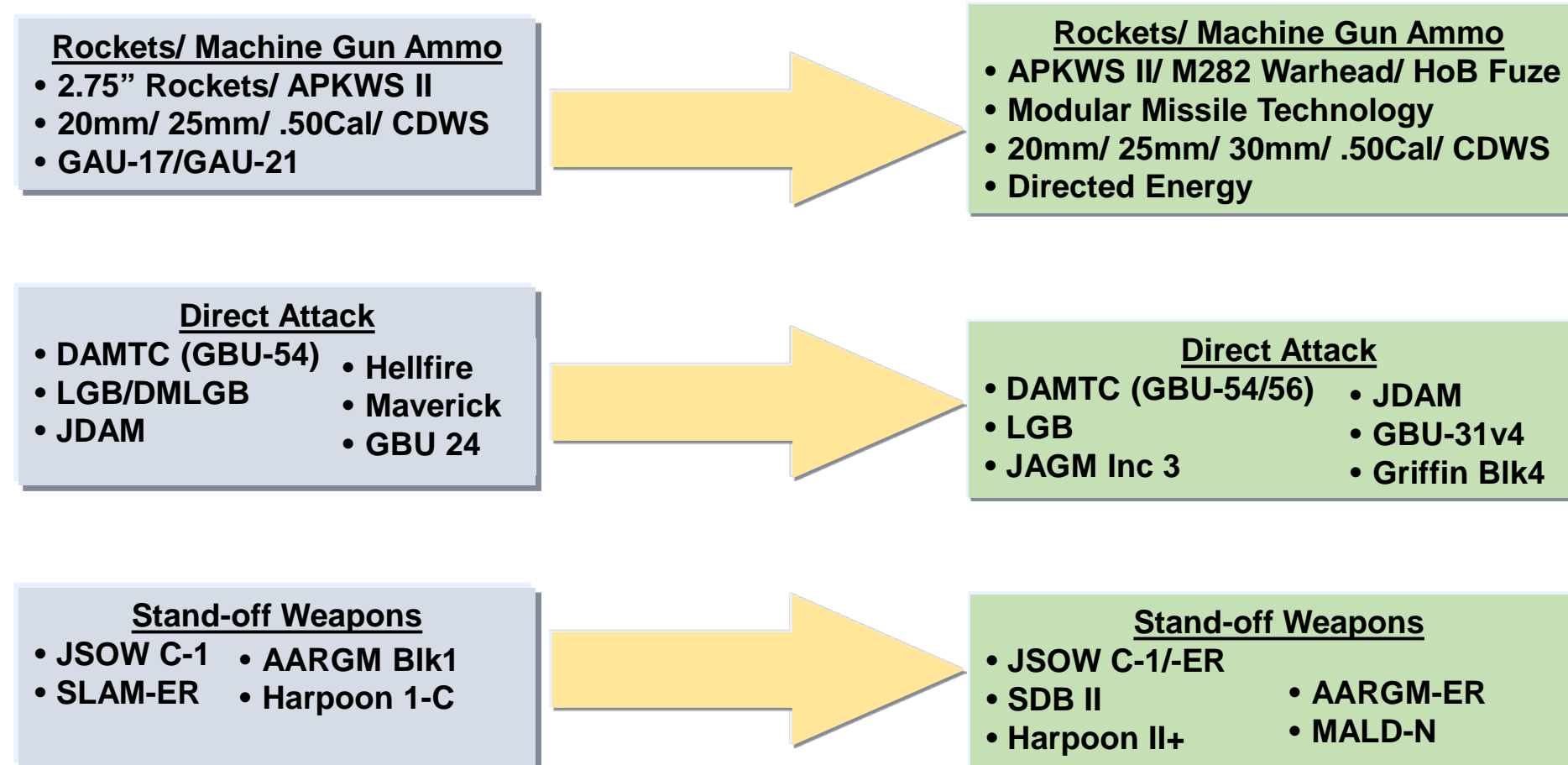
Marine aviation continues to invest in new weapons and technology that will increase precision, lethality, survivability, and interoperability to maintain the advantage on our peer competitors and ensure relevance within the Joint Force. Future weapons must be capable of operating in a networked environment, be Universal Armament Interface (UAI) compliant, and must leverage modular weapons technologies. These technologies leverage tailorability, flexibility, and effects scalability while preserving lethality; maximizing efficiency and effectiveness. Compared to traditional weapons, modular weapons are more suitable for distributed operations and contact layer forces but still provide credible capability across the full range of military operations. Additionally, technologies such as directed energy and net-enabled systems will allow operators to defeat the defensive capabilities of our adversaries.

MARINE AVIATION WEAPONS AND MUNITIONS PLAN



- Increased kills per sortie
- Economies of scale
- Maximize ship's fill space
- Low Cost
- Countermeasure resistant
- Open architecture / Reprogrammable
- Common missile with multiple delivery options (Smart Pod, Common Launch Tube, or Surface Tube-Launched)
- Universal Armament Interface (UAI) compliant

MARINE AVIATION WEAPONS AND MUNITIONS PLAN



AVIATION ELECTRONIC WARFARE PLAN

VALUE TO THE MAGTF

Marine aviation is fielding EW systems to provide commanders with an organic and persistent airborne EW capability for every MAGTF.

Marine Corps organic airborne EW capabilities include the Intrepid Tiger II (IT II) EW pod; the EW capabilities inherent to the F-35; the AGM-88 High-Speed Anti-Radiation Missile/Advanced Anti-Radiation Guided Missile (HARM/AARGM) for the F/A-18; and the AARGM in future F-35 blocks.

IT II is an EW payload providing communications Electronic Warfare Support (ES) and Electronic Attack (EA) capabilities.

- IT II deploys with each AV-8B MEU detachment and has also completed eight MEU deployments with UH-1Y detachments.
- IT II integration with KC-130J in support of the SPMAGTF-CR-AF VMGR detachment will be completed and fielded in FY19.
- Development of an IT II counter-radar capability for the MV-22B began in FY16, RDT and E is ongoing through FY21.
- Throughout FY18 IT II was deployed in support of the 15th, 31st, 26th, and 13th MEUs.

The F-35 brings a **powerful combination of EW, weapons, sensors, and reduced signature** to the MAGTF. F-35 ES capabilities include emitter geolocation, identification, and parametric data sharing via Link16.

F-35 EA is provided by the Multi-Function Array and by the AGM-88 AARGM in future F-35 blocks.



MAGTF DIGITAL INTEROPERABILITY

Digital interoperability is **the seamless integration of digital systems and exchange of data**, across all domains and networks throughout the MAGTF, naval, joint, and coalition forces, to include communication in degraded or denied environments, to rapidly share accurate information, provide greater situational awareness, accelerate the kill chain, and enhance survivability in order to outmaneuver and defeat the threat across the ROMO.

The threat that can deny, degrade, and effectively employ the latest commercial technology to achieve its military aims must be answered with a superior capability that mitigates the threat's effectiveness. MAGTF DI encompasses a multi domain, multi-disciplinary effort that harnesses commercial technological development and previous military investment in a consolidated vision that makes the most out of precious and limited assets across the domains of land, sea, air, space, and cyber. USMC aviation's approach to digital interoperability is that of building blocks that are developed through an incremental and iterative process in concert with MCCDC and cooperation with other services and other government agencies.

The goal of MAGTF DI is to **provide the required information to the right participants at the right time**, in order to ensure mission success, i.e. defeat the threat, while improving efficiency and effectiveness. This approach provides the additional advantage of responsible spectrum use, which becomes increasingly important as spectrum demands increase, as technology advances, and our MAGTFs continually operate in more distributed and disaggregated operations.

We continue to pursue integration and data exchange throughout various arenas: situational awareness; aircraft survivability; intelligence, surveillance, and reconnaissance (ISR); fire support; and logistics by conducting continuous and iterative analysis of ever evolving information exchange requirements (IERs) and the technological tools needed to satisfy those requirements.

MAGTF DI requires an ever-evolving awareness of the threat as well as the latest developments in commercial and military technology. Cybersecurity and Information assurance are also critical and must pace the threat. This approach represents a new paradigm in which it is well understood that development of new threats, especially in the cyber realm, occurs not in weeks, months, and years but in minutes, hours, and days. In this compressed timeline, it is critical to build-in security from the bottom up and have the capability to quickly adjust as new threats become apparent.

INFORMATION EXCHANGE REQUIREMENTS (IER) AND MISSION THREADS

The Marine Corps executes mission threads primarily as an integrated MAGTF organized to support the Marine rifleman. The integration of the MAGTF and the successful execution of mission threads relies on the effective exchange of critical information; communication therefore, whether in the form of electronic data or voice, is critical to the exchange of mission essential information.

An effective network infrastructure is required in order to achieve effective end-to-end communication. Network design must be based on IERs so that the right information gets to the right Marine at the right time. The fundamental approach of MAGTF DI has been to analyze mission threads from end-to-end (from planning to debrief), identify the critical IERs in the mission thread, and construct end-to-end network architectures with focus on message standards and the necessary user interfaces to optimize organic communications equipment that supports the identified IERs.

MAGTF DIGITAL INTEROPERABILITY

SENSOR, PROCESSOR, INTERFACE, RADIO AND ASSOCIATED ANTENNAS

In order to be digitally interoperable, all platforms must be enabled from end to end in terms of the equipment required to be digitally capable.

At a minimum, a platform must possess and integrate the following four things (pillars) to be digitally interoperable:

- A **sensor** that takes information from the environment and turns it into digital data; examples include Aircraft Survivability Equipment (ASE), targeting pods, and a Marine's senses.
- A computer **processor** that can take the digital data from the sensor(s) and translate and format it for display or transport; examples include overhead in existing platform mission computers, additional processor cards in other related or unrelated systems, and stand alone processors.
- An **interface** that allows the system user to interact with the translated and formatted data from the processor; examples include integrated MFD, hand held electronic tablet, and laptop computer.
- **Radios and associated antennas** that can transmit and receive the translated and formatted data; examples include MIDS-J, ARC-210, STT, 117G, SRP, and Vortex.

Each of these components is required to fulfill the information exchange requirements in a constant integrated loop. Absence of a single component breaks the loop.

MODELING INTEGRATED CAPABILITIES

MAGTF DI is a complicated endeavor that relies on accurate iterative analysis of information exchange requirements, mission threads, and platform capabilities including the four pillars of DI. Not only do the four pillars of DI need to be aligned and integrated on individual platforms, the platforms themselves then need to be integrated into an overall network that supports actions at the tactical edge. The complex interactions that occur at the physical, network, transport, message, and interface layers require a modeling tool that moves beyond simple paper analysis.

Currently, the services make acquisition decisions based upon specific, deliberate planning to address specific capability gaps. The process typically focuses on specific areas within a mission thread. It is not designed to take into account all of the end-to-end mission thread requirements that are actually required to effectively execute the mission thread.



MAGTF DIGITAL INTEROPERABILITY

As technology continues to advance, it becomes increasingly more difficult to apply the traditional JCIDs /acquisition processes and field current technology capabilities. Modeling and simulation becomes extremely important to that process. With the proper investment and agreed upon standard framework, we can run a mission thread, understand where the model breaks down, insert technology modules, then re-run the mission thread to understand how that technology impacts the mission thread execution. Once we identify the desired improvement, then we can run the same scenario with a red threat present and see what this analysis reveals. This is the first phase in beginning to understand and quantify technologically challenging problems. The results of the model can then be used to inform a capability demonstration, or experiment.

Understanding the model and the performance expectations, will also inform what measurable performance data the Marine Corps should capture during the demonstration. This increases the value of the investment, because it begins to form the basis for understanding how to effectively measure the quality of the integration efforts. One additional benefit to this approach is that the real-world performance can then be compared to the model and inform improvements to the model to more closely reflect real world performance.

Understanding the capabilities in the larger context of the mission thread will enable educated financial decisions and identify any other gaps that may exist within the mission thread. This approach helps to close the loop in understanding mission thread shortfalls and enhancements, while enabling a building block approach that becomes a process of improvements, vice a "single solution to fix all things". Leveraging a capability such as the Naval Simulation Services (NSS), will enable the Marine Corps to make informed investments and to then plug the model into the larger Navy NSS investment to better

understand the naval integration and investment stagey for interoperability and how to improve naval integration to increase lethality and mission effectiveness.

BRIDGING THE ENTERPRISE TO THE TACTICAL EDGE

Modeling efforts and analysis have made clear that when discussing commercial technology a common misunderstanding stymies development of technical solution that are able to support true tactical edge operations. Even the department of education identifies broad band internet as greater than 25Mbps and NETFLIX advertises that greater than 5 Mbps is sufficient to stream HD quality content. Enterprise networks such as those in an office or that support commercial cell phones are characterized by assured connections, static access points, and high bandwidth usually in excess of 100 Mbps. Enterprise networks employ common commercial standards for data transport that are supported by billions of dollars of commercial investment.

Tactical networks such as an ANW2 mission plan works best at 56Kbps. In fact Tactical networks are characterized by unassured connection, dynamic access points, and low bandwidth. To further complicate this problem, tactical network standards vary by capability and radio, there is no overarching common standard. The criticality of understanding the differences reveals that direct application of Enterprise management and standards to a Tactical network typically results in a tactically irrelevant network. It is critical to understand the fundament difference between these two types of network and to further understand how they might be bridged.

MAGTF DIGITAL INTEROPERABILITY

DI EFFORTS TODAY

Current enhancement and future procurement is the result of continuous end to end live and virtual analysis, through multiple efforts, of both USMC mission thread IERs and USMC platform capabilities.

Capabilities – The MAGTF as a whole employs **four primary tactical data links**, fielded widely enough across the MAGTF that minor enhancements to platforms can greatly increase overall MAGTF capabilities. **Link-16** is employed by F-35 and F-18 in support of TACAIR mission threads. **High Performance Waveform (HPW) and Agile Network Wideband Waveform (ANW2)** are capabilities resident on the PRC-117G radio that is fielded widely across the ground forces. **Tactical Targeting Network (TTNT)** supports ground communication with the Intrepid Tiger 2 pod in support of Electronic Warfare mission threads. **Common Data Link (CDL)** receivers are fielded widely among the ground forces and is a capability resident on most UAS as well as targeting pods in support of dissemination of full motion video.

Capability Gaps – The assault support assets (H-1, MV-22, CH-53, and KC-130) possess *sensors* in the form of ASE, they have **limited integration with a processor, interface, and radios** that can make use of data provided by those sensors. The TACAIR assets (FA-18, F-35, and AV-8) possess some integration between *sensors, processor, interface, and radios*, but lack of common equipment across the entire MAGTF prevents the flow of data resident on those platforms.

MAGTF DI Kit -- Filling the capability gap of *processor, interface, and radio* on MV-22, H-1, CH-53, and KC-130 today is the combination of a PRC-117G or PRC-152A ANW2 capable radio combined with a secure commercial off the shelf electronic tablet interface named Marine Air Ground Tablet (**MAGTAB**) and a Commercial Encrypted WiFi Link (CEWL). These devices are combined in a flight cleared configuration that enables an airborne tactical network as well as communication with similar systems on the ground.

DI kits are fielded in support of MEUs from both coasts and Japan as well as the SPMAGTFs. Critically, the MAGTAB is a standardized secure collaborative briefing, planning, execution, and de-briefing tool.

Naval Simulation Services (NSS) – In an effort to more efficiently determine functionality and effectiveness in a range of environments, USMC aviation and MCCDC together have partnered with NSS to model threats and capabilities to assist in developing requirements. Understanding that all models are wrong, but some models are useful, NSS is used as a tool that quickly confirms or denies assumptions in network design and overall system effectiveness. This approach allows statistically significant numbers of runs to be made with multiple excursions of a multitude of configurations. This effort will continue to expand to integrate a red team capability across multiple mission threads into the future. Additionally, the adoption of this approach leverages the US Navy CBA investment

in the same modeling architecture and enables the rapid expansion from analysis of a MAGTF mission thread, to the larger Naval Kill Web assessment and modeling capability.

SOFTWARE RECONFIGURABLE PAYLOAD (SRP)

SRP (formerly Software *Reprogrammable* Payload) is a **software-defined radio that has the capability of hosting up to 7 waveforms simultaneously** while offering an advanced embedded multi-level security architecture known as the Programmable Embedded Infosec Product (PEIP). SRP Increment 1.5 is deployed in support of some U.S. Navy capabilities, however it lacks required existing MAGTF waveforms. To align with the existing architecture of the MAGTF, the following waveforms are being conveyed into SRP Increment 2; Link-16, ANW2, BE-CDL REV-B, and TTNT.

MV-22 is the lead platform for SRP Increment 2 integration, and will be followed immediately by the CH-53E/K and KC-130. Link-16 fulfills the air picture and enables growth for DACAS potential, ANW2 radios continue to be proliferated throughout the Ground Combat Element, BE-CDL will expand on the existing CDL network facilitating the Type 1 ISR mandate and a far more capable waveform that will enable the furthering of payload control, and TTNT continues to enable increased traffic for information exchanges, range extension, and dynamic spectrum maneuvering.

MAGTF DIGITAL INTEROPERABILITY

MISSION PLANNING

Enables Collaborative Planning. Enables up to 20 MAGTAB users to simultaneously connect to a single WiFi node to communicate and collaboratively digitally plan.

Compatibility with Other Systems. Integrated architecture allows for building products on any computer and transferring/converting them through the MMS to the MAGTAB saving time and resources (i.e. build JMPS files on JMPS machine, convert the routes to .kmls using MAGTAB tools, and load files to MAGTABs through the mission management system).

Consistency. Consistent and uniform products across MAGTABs simultaneously loaded by MMS over Secure WiFi.



MISSION DEBRIEF

Provides Debrief on MAGTAB. Connect the MAGTAB to a projector or TV and debrief all smart pack products.

Export Smart Pack Products. Export or save completed ExCheck, Comm Cards, products for using in mission planning.

Automatically Produces Mission Replay in Google Earth. Download data from CEWLs onto MMS to provide real time mission replay with position, chat, ExCheck, and network status in Google Earth.

MEU DI KIT EMPLOYMENT PHASES

Standard Interface tool



for the MEU Marines

MISSION BRIEFING

Access. Users (i.e. Radio Operators or Avionics) can op-check the DI Kit without having to interfere with operations.

Accurate Products. Users make pen and ink changes to smart pack products in real time digitally.

Status. Obtain detailed network status and verify system functionality prior to starting the mission.



MISSION EXECUTION

Smart Pack Products. Use smart pack products during planning phase and make adjustments as necessary providing real time status and operational updates.

On the Move Operations. Secure WiFi capability provides on the move operations.

Synchronization. Automatically syncs majority of MAGTAB and Networking info providing a common, consistent tactical update.

MAGTF DIGITAL INTEROPERABILITY

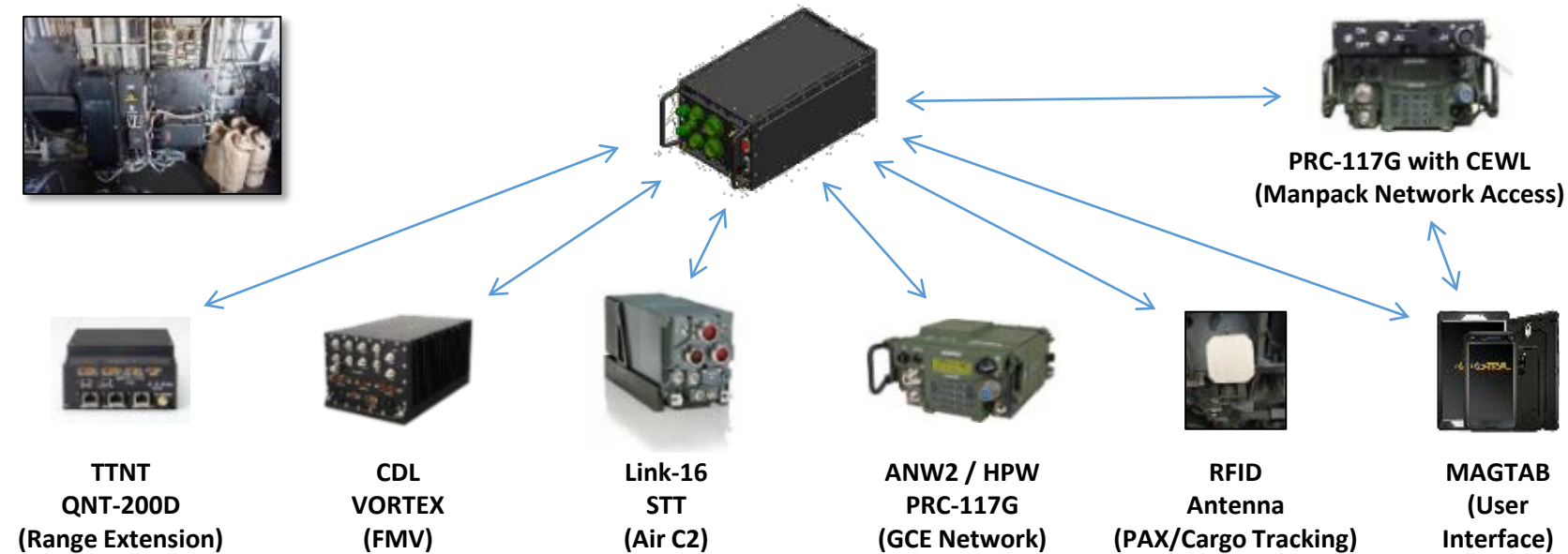
NEAR TERM DI EFFORTS

SPMAGTF enroute C4 UUNS -- The 2015 15th MEU assessment solidified the requirement for software-defined radios, airborne gateways, mesh network data exchanges facilitating maneuvering within spectrum, and encrypted wireless tablets in the hands of the operator. Ongoing efforts have and will continue to assist in the seamless integration, decreased kill-chain, and enhanced battlefield situational awareness throughout the MAGTF. This capability has been codified in the MROC-approved SPMAGTF enroute C4 US.

This effort, fielding in mid FY19, combines Mesh Network Manger (MNM) with off the shelf radios and additional antennas integrated into MV-22 in a roll on roll off configuration. **The radios support the five previously**

identified waveforms, while the Mesh Network Manager addresses the processor gap, and the Marine Air Ground Tablet (MAGTAB) fills the interface gap. Modifying the aircraft so that this capability is fully integrated under glass is not feasible in terms of cost and time in the short term. The Mesh Network Manager enables waveform and message translation capability that allows information to be shared across previously disparate systems while ensuring the data sent across the multiple networks is bandwidth efficient. This approach also is leveraged to provide coordinated mission critical updates and collaboration across multiple gateways and nodes operating within the constraints of a tactical network.

MESH NETWORK MANAGER (DATA FORWARDING, MESSAGE TRANSLATION, MISSION PROCESSING, NETWORK HEALTH MANAGEMENT)



MAGTF DIGITAL INTEROPERABILITY

GATEWAYS

Gateways will serve as a conduit between disparate networks and waveforms on the current battlefield. Gateways possess the ability to receive one waveform/message type and process it into another waveform/message type before offboarding the data. Due to the inherent difficulties of replacing or adding new systems to some Marine aviation platforms, **adding airborne gateways enables information exchanges across a variety of systems and networks.**

The increased prevalence of airborne gateways will provide data exchange capabilities throughout the MAGTF without each platform having to be equipped with every waveform currently being used on the battlefield providing network access for the ground combat element with the gear they already carry.

Airborne gateways, such as the Mesh Network Manager (MNM), utilize a collection of radios and conducts message translation and processing for dissemination leveraging software that is interoperable with SOCOM, the joint services, and other government organizations.

Gateways present an opportunity, but come with challenges. Proliferation of gateways in a tactical environment, without accounting for the appropriate data conditioning and replication coordination across multiple gateways, linking up multiple tactical networks, can lead to degraded services and network degradation. Responsible coordinated implementation is absolutely required to ensure success, this is yet another example of why the modeling and simulation capability is so important.

LONGER-TERM DI EFFORTS

MAGTF AGILE NETWORK GATEWAY LINK (MANGL)

The SPMAGTF enroute C4 US is the Initial Capabilities Document (ICD) for MANGL. The Capabilities Development Document (CDD) for MANGL is in development leveraging lessons learned over the last six years by HQMC aviation and MCCDC.

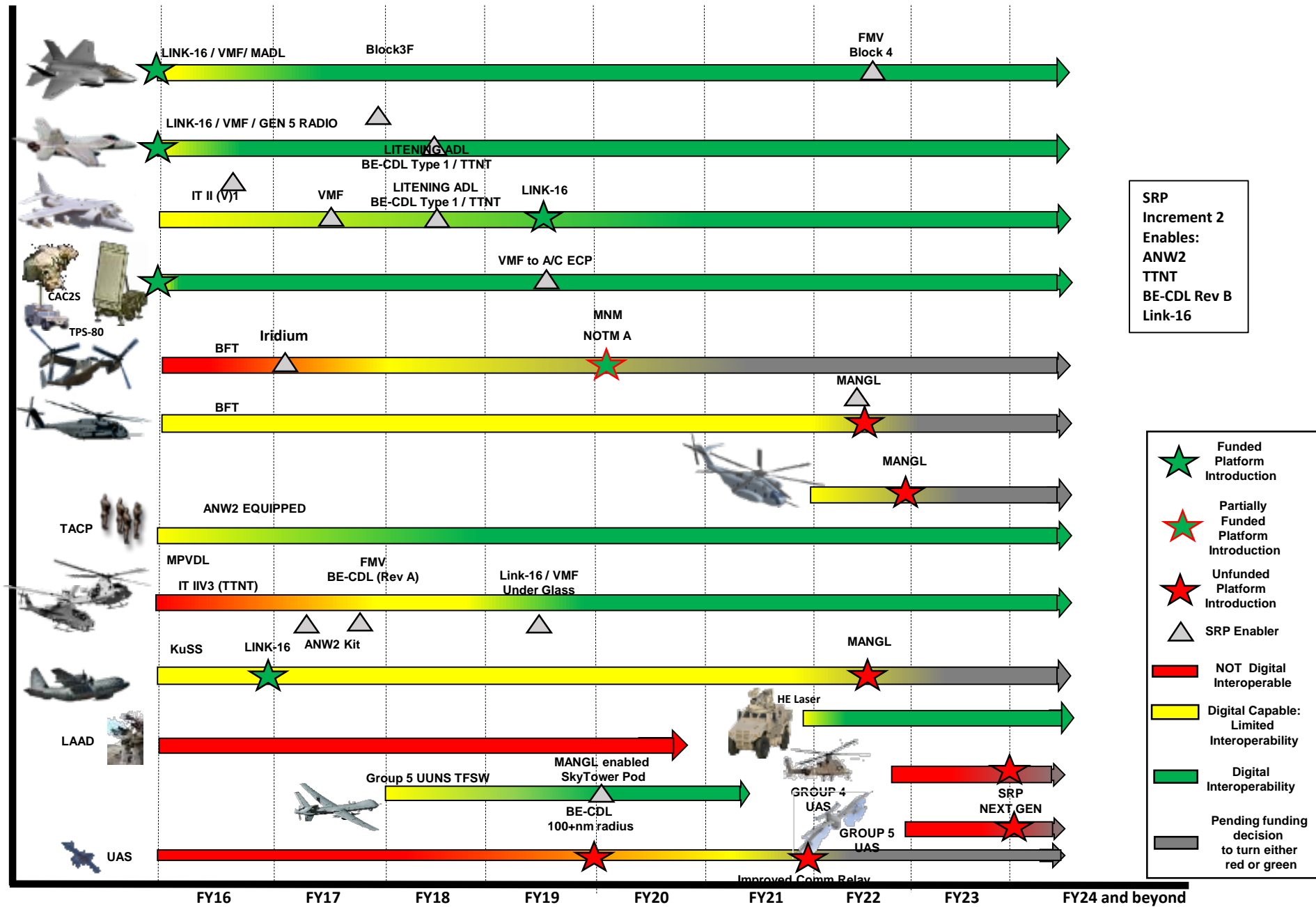
The MANGL CDD will clearly articulate the desired capabilities of the MANGL system that will eventually be installed on MV-22, CH-53, KC-130 as well as future UAS swap dependent. MANGL will incorporate Tablets, Gateways, and Software Reprogrammable Payload (SRP) to replace the four radios employed by the SPMAGTF enroute C4 US effort. MV-22 is the lead platform with fielding beginning in FY21.

FUTURE DI EFFORTS

Miniaturization of software-defined radios will increase disembarked Marines' network access available down to the squad leader. Innovative efforts such as NET-T AJ, Low Probability of Detection/Intercept, and data clouds remain on the horizon. Sensor fusion through the existing program of record **Minotaur** seeks to consolidate the shared platform information automating sensor collaboration for the operator interface. Technology advances are allowing us to use spectrum more efficiently and effectively in the areas of frequency, time, space, and modulation. This architecture is critical to enabling the dismounted Marine access to the multitude of sensors across the battlespace.

Individual platforms are leveraging existing technology in the near term to ensure access to the tactical grid of once disparate networks on the ground and in the air. **By FY23 every Marine Corps platform will have multiple standardized links** to meet IERs across all MAGTF mission threads.

MAGTF DIGITAL INTEROPERABILITY



AIRCRAFT SURVIVABILITY EQUIPMENT (ASE) PLAN

The Marine aviation vision is to equip all our aircraft with ASE that use modular, open system architectures that provide radio frequency (RF) and electro-optic (EO)/infrared (IR) spectrum warning capabilities. Inexhaustible/expendable countermeasure systems are fully optimized to ensure aircraft and aircrew survivability across the platform's full range of operations while providing threat engagement information and situational awareness (SA) across the digital battlespace.

Current baseline mission sensor capabilities equip Marine Corps fixed-wing, tilt-wing and rotary-wing aircraft with a variety of situational awareness (SA) and countermeasure capabilities in the RF and EO/IR spectrums.

Many of these capabilities are aircraft platform-tailored solutions that support each platform's required operational threat environments and contribute to platform tactics, techniques and procedures (TTP) for susceptibility reduction.

HQMC Aviation collaborates with numerous DoD and service-specific entities, including MAWTS, NAVAIR, PMA272, Joint Electronics Advanced Technology (JEAT), service aviation training commands (NSAWC), Joint Aircraft Survivability Program Office (JASPO), all service laboratories (DARPA, NRL, ONR, AFRL and ARL), and other services' science and technology development organizations to achieve desired goals.



MARINE AVIATION ASSAULT SUPPORT ASE PLAN

The AAR-47 Missile Warning System (MWS) is an electronic warfare system designed to protect aircraft against IR guided missile threats, laser-guided / laser-aided threats and unguided munitions. Upon detection of the threat, the system will provide an audio and visual sector warning to the pilot. For IR missile threats, the system automatically initiates countermeasures by sending a command signal to the Countermeasure Dispensing Set. The AAR-47 is currently deployed on MV-22B, AH-1W/Z, UH-1Y, CH-53E and KC-130J aircraft.

The AAQ-24 Department of Navy (DoN) Large Aircraft Infrared Countermeasure (DoN LAIRCM) system is an advanced Missile Warning System (MWS), Laser Warning, and Hostile Fire Indicator “front end” and directed energy, Guardian Laser Turret Assembly (GLTA) IRCM “back end”, to be fielded on the CH-53E/K, KC-130J, and MV-22 aircraft. The Advanced Threat Warner (ATW) upgrade provides aircrew with improved situational awareness using advanced two color IR MWS sensors to detect IR guided missiles (e.g. MANPADS), hostile fire (AAA, small arms/RPGs), and Band A/B lasers and hand-off threat information to IRCM (GLTA, flares.) The current size and weight of the GLTA and Central Processor excludes AAQ-24 as a suitable IRCM solution for smaller aircraft (H-60/H-1).

The Distributed Aperture IRCM (DAIRCM) is a light weight MWS and integrated IRCM developed by NRL under an FY04 ONR FNC with additional risk reduction funding from PMA-272. This system has been OSD approved in response to JUONS SO-0010 and is a viable path forward as a Program of Record for the H-1 community offering significant savings in size, weight and power (SWaP) as well as cost avoidance.

The APR-39 Radar Warning Receiver (RWR) series provides aircraft with a Radar Signal Detecting Set (RSDS) designed for use on USMC, USN, and USA assault support aircraft in order to provide onboard situational awareness and warning of radar threats. The system also provides control and display of the AAR-47 Missile Warning System and



sends radar threat information to the ALE-47 Countermeasure Dispensing Set (CMDS) for determination of the appropriate dispense response. The APR-39D(V)2 will correct major deficiencies and obsolescence in the current version.

The ALE-47 Countermeasure Dispensing Set (CMDS) is an integrated, threat-adaptive, reprogrammable, computer controlled capability for dispensing expendable decoys to enhance aircraft survivability in sophisticated threat environments. The CMDS receives threat data from the aircraft’s survivability sensors (MWS and/or RWR), as well as aircraft navigational data from the aircraft mission computer and then selects the appropriate response to the threat in terms of expendable types to be employed (Chaff and/or Flares), dispersal sequence, timing and zone selection for the most optimized dispense response.

TECHNOLOGY TRANSITION AGREEMENTS (TTAs)

Multi-Spectral Electro-Optical/Infrared Seeker Defeat (MSSD): Will seek to develop techniques, components, and technologies to improve the ability to defeat advanced multi-spectral EO/IR MANPADS by (1) better understanding the advanced MANPAD threat posed to rotorcraft and the current countermeasure capabilities that are employed and (2) developing advanced flares/obscurants and laser sources to better defeat advanced MANPADS.

MARINE AVIATION ASSAULT SUPPORT ASE PLAN

The AN/ALR-67(V)2 countermeasures warning and control system is the standard threat warning system for tactical aircraft and was specifically designed for the F/A-18 and AV-8B aircraft. The system detects, identifies and displays radars and radar-guided weapon systems in the C to J frequency range (about 0.5 to 20 GHz) and sends the radar threat information to the ALE-47 Countermeasure Dispensing Set (CMDS) for determination of the appropriate dispense response. The system also coordinates its operation with onboard fire control radars, datalinks, jammers, missile detection systems and anti-radiation missiles.

The AN/ALR-67(V)3 is an upgrade to the ALR-67(V)2 system originally referred to as the Advanced Special Received (ASR) set. The receiver electronics unit has been upgraded to a fully channelized digital architecture with dual 32-bit processors, yet with an overall reduction in system size and weight. The Azimuth Display Indicator (ADI) is a 3 in (76.2 mm) diameter CRT or LCD cockpit display, carried over from the AN/ALR-67(V)2, used to show intercepted threats.

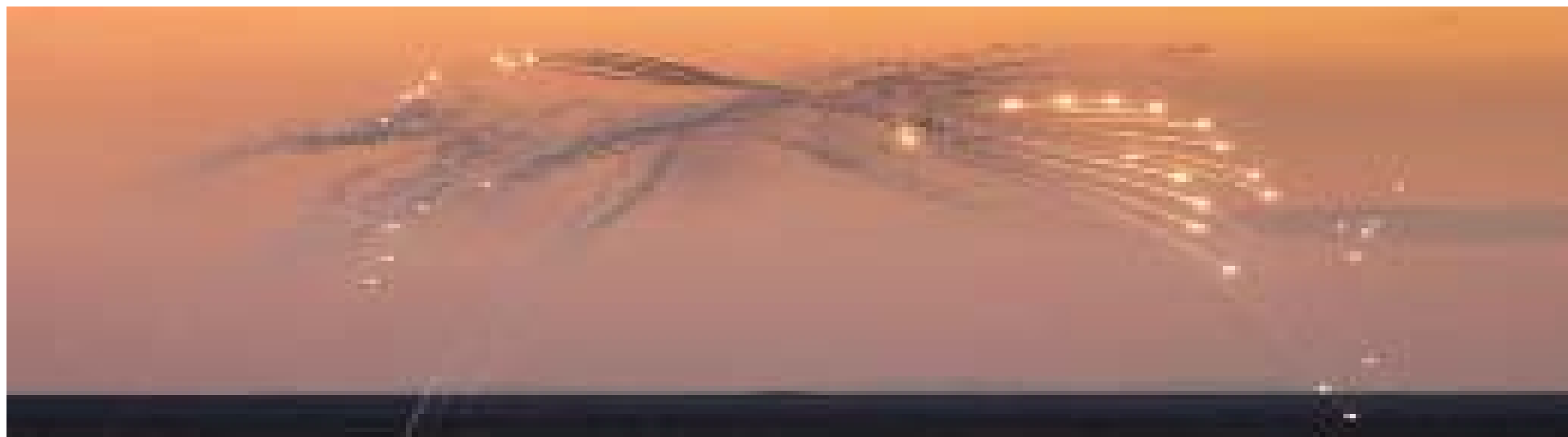
The Integrated Defense Electronic Countermeasure (IDECM) Block 4 ALQ-214(V)5 Jammer will provide self-protection for the F/A-18 C/D by establishing a common on-board jammer solution to counter modern SAM and Air-to-Air RF Threats. ALQ-214(V)5 IOC is slated for FY18. The IDECM Software Improvement Program (SWIP) is scheduled for fleet release in FY18, and will provide for additional DRFM techniques to

degrade a threat's ability to engage while also improving interoperability, timeline challenges, and the ability to engage multiple threats simultaneously. The ALQ-165 Air Self-Protection Jammer (ASPJ) will be replaced by the ALQ-214(V)5 providing a baseline ASE suite of ALR-67(V)3, ALQ-214(V)5, and ALE-47.

The ALE-47 Countermeasure Dispensing Set (CMDS) is an integrated, threat-adaptive, reprogrammable, computer controlled capability for dispensing expendable decoys to enhance aircraft survivability in sophisticated threat environments. The CMDS receives threat data from the aircraft's survivability sensor (RWR), as well as aircraft navigational data from the aircraft mission computer and then selects the appropriate response to the threat in terms of expendable types to be employed (Chaff and/or Flares), dispersal sequence and timing for the most optimized dispense response.

FUTURE NAVAL CAPABILITY (FNC)

FNC programs will address expanded frequency threats through GAP analysis and provide solution sets comprised, but not limited to ALQ-214, and advanced IR/RF expendables in addition to smart dispense technology.



MARINE CURRENT ASE

* Items in *red italics* have not yet been fielded



MV-22B
 APR-39A(V)2
 APR-39C(V)2
 AAR-47E(V)2
 ALE-47



UH-1Y
 APR-39B(V)2
APR-39D(V)2
 AAR-47E(V)2
 ALE-47



AH-1W
 APR-39A(V)2
 ALQ-144C(V)1
 AAR-47E(V)2
 ALE-47 (w/PWR PC)



AH-1Z
 APR-39B(V)2
APR-39D(V)2
 AAR-47E(V)2
 ALE-47



KC-130T
 APR-39A(V)2
 AAR-47E(V)2
 ALQ-157A(V)1
 ALE-47



KC-130J
 ALR-56M
 AAR-47E(V)2
 ALE-47
 ALQ-157A(V)1
AAQ-24B(V)25



AV-8B
 ALR-67(V)2
 ALQ-164
 ALE-47
 (ALE-39 Mode or Full ALE-47 with AFC-490)



F/A-18A/A+/B/C/D
 ALR-67(V)2
 ALQ-126B
 ALQ-165
ALQ-214(V)5
 ALE-39/ALE-47



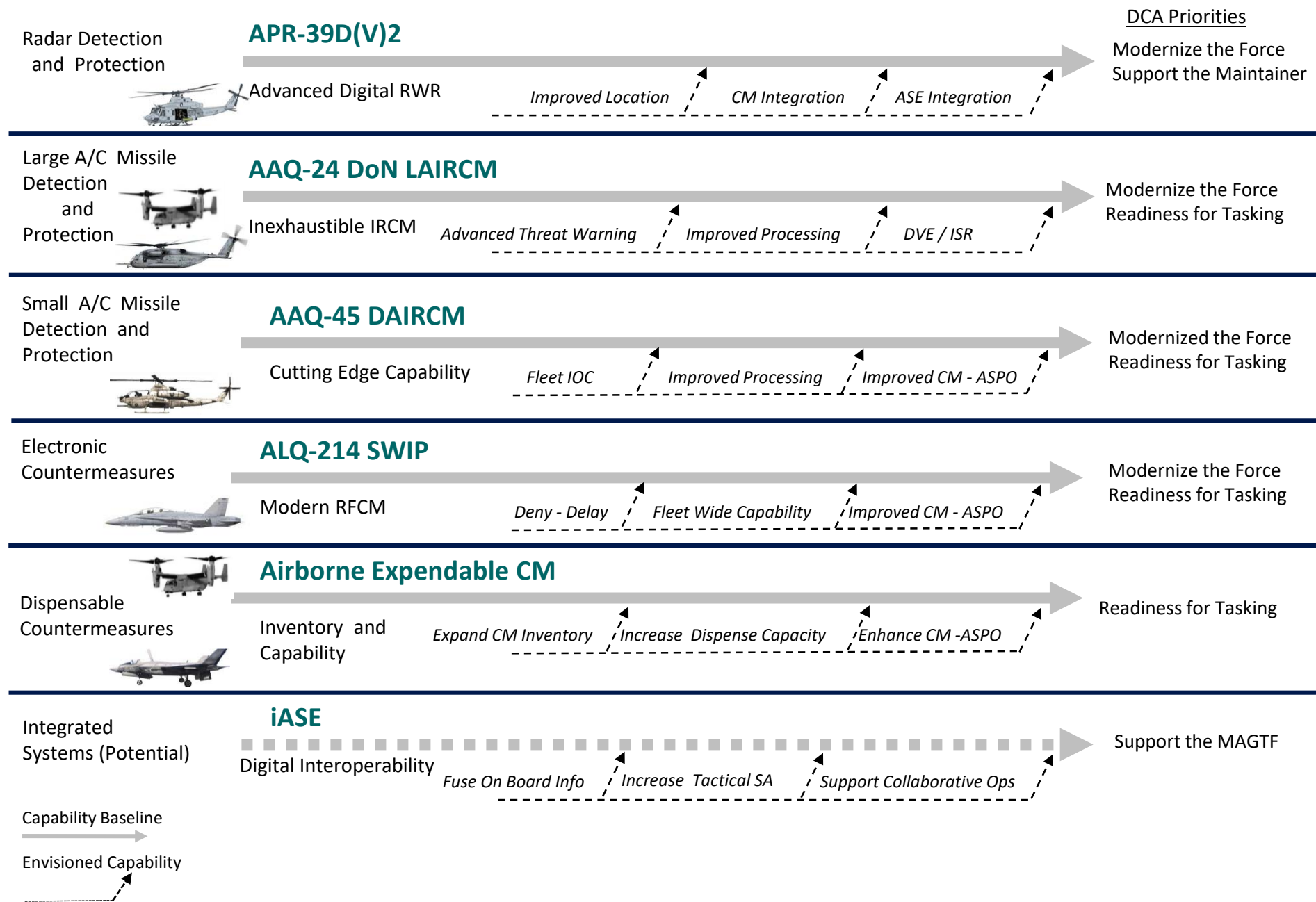
UC-12W
 AAR-47E(V)2
 ALE-47



UC-35
 AAR-57
 ALE-47

F-35B and F-35C
 ASQ-239

MARINE ASE PATH FORWARD

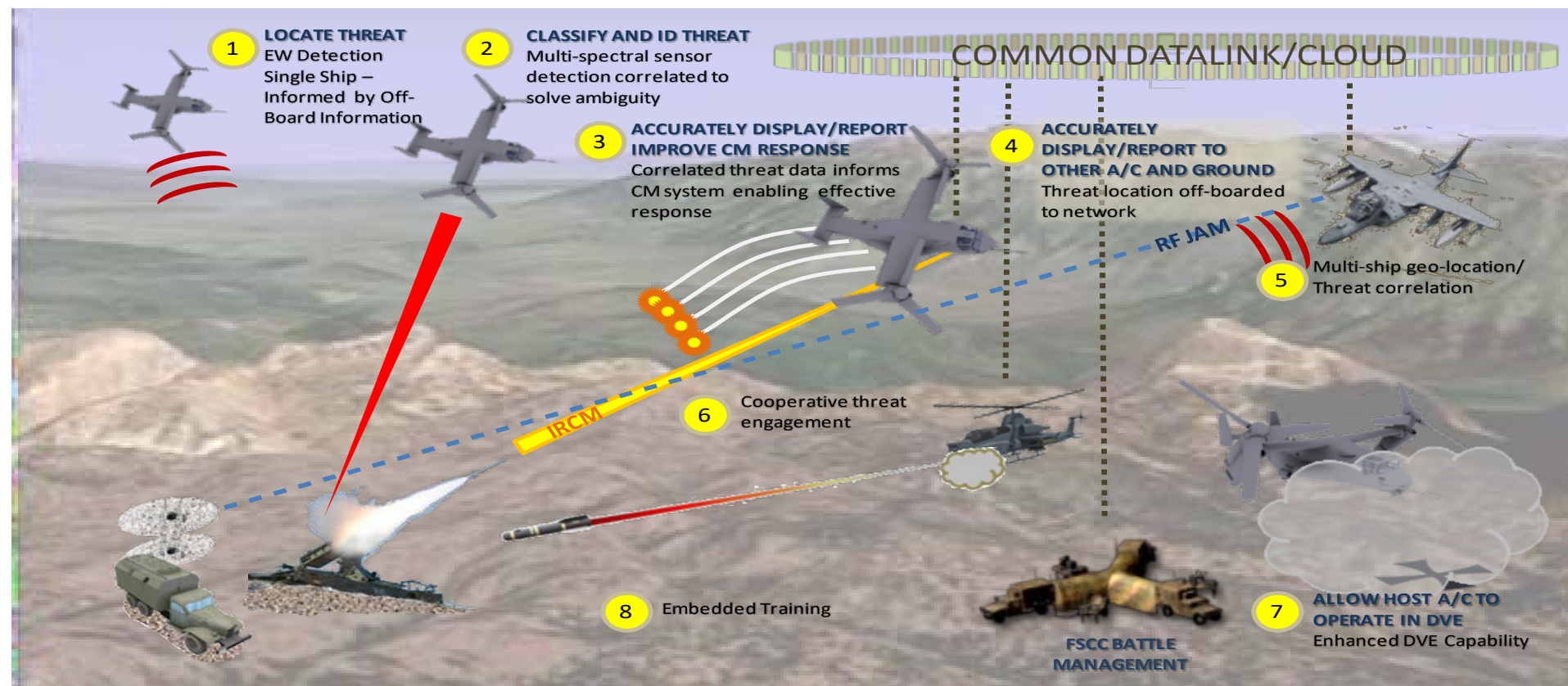



INTEGRATED AIRCRAFT SURVIVABILITY EQUIPMENT

Integrated Aircraft Survivability Equipment (iASE) will provide the capability to cooperatively use information derived from on-board and off-board systems or networks to enhance aircraft protection, combat survivability, and mission effectiveness by providing situational awareness of flight and mission environments to warfighters and the supporting network systems, thus enabling the most survivable and effective single or multi-system response available.

DESIRED CAPABILITY

- **Locate threats:** accurately display/report threats to host aircraft
- **Classify/id threats:** share threats with ground forces, aircraft, commanders
- **Avoid engagement:** prevent track or lock-on
- **Embedded training:** locate obstacles or other aircraft





Section 4 Marine Aviation Operational and Readiness Enablers

4.1 Marine Aviation Expeditionary Enablers

4.2 Tactical Air Control Party

4.3 Marine Aviation Synthetic Training

4.4 Military Construction and Ranges

MARINE EXPEDITIONARY ENABLERS:

MARINE AIR COMMAND AND CONTROL SYSTEM (MACCS) AND AVIATION GROUND SUPPORT (AGS) PLAN

THE AVIATION EXPEDITIONARY ENABLERS VISION

The operating environment is evolving and our next conflict is largely unpredictable. What remains constant, however, is the contribution of aviation's enablers – *the ability and credibility to control our own airspace and operate from expeditionary sites, which 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 recent history, such as recognizing the role of information as a weapon, and manning, training, and equipping a force where digital interoperability is the norm. The aviation expeditionary enabler community has embarked upon this transformation.

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, 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 model 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 then 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 throughout the AO requires all MACCS agencies 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 IOC of our Aviation Command and Control (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. This is a specific goal of the Commandant's vision of NDS implementation.

MARINE EXPEDITIONARY ENABLERS:

MARINE AIR COMMAND AND CONTROL SYSTEM (MACCS) AND AVIATION GROUND SUPPORT (AGS) PLAN

The AC2 Transition Task Force (TTF) has stood up with the intent to align all aspects of DOTMLPF and ensure the MACCS is poised to support future operating concepts. Additionally, a MACCS Independent Readiness Review was completed for a comprehensive understanding of the factors driving, or detracting from, readiness across the community. Priority recommendations were established for: current readiness; training; manpower; maintenance, supply and logistics; and governance.

Command and control capabilities provide the means by which a commander recognizes required tasks and sees to it that appropriate actions are taken. It includes collecting and analyzing information, managing resources, planning, communicating instructions, monitoring results, making decisions, supervising execution and making assessments.

The Marine Air Command and Control System serves as the facilitator for the timely employment of Marine aviation assets and effective application of combined arms, and enables MAGTF freedom of action throughout the battle space.

The MACCS structure embodies the Marine Corps belief that

No activities in war are more important than command and control. Through command and control, the commander recognizes what needs to be done and sees to it that appropriate actions are taken...it provides purpose and direction to the varied activities of a military unit. If done well, command and control add to the strength of a force.

Marine Corps Doctrinal Publication 1-0

The MACCS provides the Aviation Combat Element (ACE) commander with the agencies and assets necessary to exercise aviation command and control and air defense in support of the MAGTF, naval, and joint operations. These agencies provide the ACE commander with the ability to execute the six functions of Marine aviation.

TACTICAL AIR COMMAND CENTER (TACC)

The TACC provides the MAGTF with the ability to plan and execute an air tasking order (ATO) in direct support of the MAGTF, integrate with the joint force, and seamlessly absorb the support of coalition forces through its flexible design. The TACC provides the **functional interface for employment of MAGTF aviation in joint and multinational operations.**

TACTICAL AIR OPERATIONS CENTER (TAOC)

The **TAOC distributes the air picture to the MAGTF** and joint commands while controlling deep air support, aerial refueling and anti-air-warfare (AAW) operations and routing itinerant aircraft. Newly fielded systems have transformed the TAOC into a highly mobile AC2 agency. With the completed fielding of the Composite Tracking Network (CTN) and the achieved IOC of TPS-80, the TAOC will exchange high fidelity radar data with the Navy's Cooperative Engagement Capability (CEC) network.

The combined capabilities of CAC2S, CTN and TPS-80 put the TAOC at the forefront of force protection for the MAGTF.

MARINE EXPEDITIONARY ENABLERS:

MARINE AIR COMMAND AND CONTROL SYSTEM (MACCS) AND AVIATION GROUND SUPPORT (AGS) PLAN

DIRECT AIR SUPPORT CENTER (DASC)

The **DASC is the critical link between the ACE and GCE** within the MACCS. The DASC continues to conduct its core mission of processing immediate requests for air support and has expanded its ability to control ever increasing and complex volumes of airspace.

With the fielding of CAC2S Phase I, the DASC now has a standard set of equipment for a near real-time air picture used to enhance situational awareness, increase safety of flight, and more effectively integrate aviation assets with surface-to-surface fires.

MARINE AIR TRAFFIC CONTROL (MATC)

MATC detachments provide all-weather air traffic control services to friendly aircraft operating in support of the MAGTF or within their assigned airspace. The continued development of the highly expeditionary ATNAVICS has ensured MATC's ability to meet mission requirements across the range of military operations with increasing interoperability and functionality as an AC2 node within the MACCS, until fielding of future systems. Normally focused upon airspace requirements in and around the airfield, MATC has become more involved in the clearance of fires and the safe integration of new platforms and UAS into operational airspace.

Recent history has also shown the need for the ACE to protect high-value assets (HVAs). This mission requires the close coordination and digital integration of MATC and the Low Altitude Air Defense (LAAD) Battalion.

LOW ALTITUDE AIR DEFENSE BATTALION (LAAD)

The LAAD battalion's capability to provide **air and ground defense of airbases and MAGTF high value areas (HVAs)** in an evolving battlespace is a critical tool for the ACE commander to meet force protection and AAW responsibilities. The LAAD community is in the initial phase of transitioning to an improved integrated air and missile defense (IAMD) family of systems (FoS) to meet the primary threat set UASs, and the secondary threat set of cruise missiles and manned FW/RW aircraft.

LAAD battalions have successfully conducted ground defense of Forward Operating Bases (FOBs) and security force (SECFOR) tasks during OEF/OIF. The SECFOR tasks included internal and external security along with tactical recovery of aircraft and personnel (TRAP), and training of indigenous and coalition forces in counterinsurgency operations.

In the future, the community will leverage defense innovation and technologies to provide AAW and SECFOR capabilities to defeat an adversary's threat to destroy MAGTF HVAs.



MARINE EXPEDITIONARY ENABLERS:

MARINE AIR COMMAND AND CONTROL SYSTEM (MACCS) AND AVIATION GROUND SUPPORT (AGS) PLAN

MARINE WING COMMUNICATIONS SQUADRON (MWCS)

MWCSs will continue to be in demand for data pathways between ACE, MAGTF and joint/coalition elements. The MWCS integrates numerous systems ranging from single-channel radio to systems with an emphasis on interoperability and BLOS communications for a broad spectrum of information services. These services include video, multimedia, data, and imagery which provide the ACE with a reliable communications architecture.

METEOROLOGICAL AND OCEANOGRAPHIC (METOC)

The Meteorological and Oceanographic (METOC) section, resident in the Marine Air Control Squadron MATC Detachment (MACS MATCD), is task-organized to provide direct support to the ACE.

With the AN/TMQ-56 Meteorological Mobile Facility (Replacement) Next Generation [METMF(R) NEXGEN], the METOC section has become a highly maneuverable capability that provides environmental sensing, products, and mission impact assessments to the MAGTF commander to support a variety of deployments and operations.

Additionally, METOC Support Teams (MST), sourced from either the MACS MATCD or the Intelligence Battalion, utilize the stand-alone Naval Integrated Tactical Environment Subsystem – Fielded (NITES-Fielded), (previously known as NITES IV), to provide METOC support to forward operating bases (FOBs) for any MAGTF.

FUTURE MACCS EMPLOYMENT

Marines in combat will always need varying degrees of air support, air defense/surveillance, and a command post for the ACE. Current agencies and unit organization will remain the baseline and point of departure for any near-term MACCS re-organization.

As the Marine Corps rebalances its forces to support increasingly dispersed operations with smaller forces over greater distances, aviation must adapt by providing **new AC2 employment options for the MAGTF** commander, both ashore and afloat. These options must continue to provide task-organized, expeditionary, and state-of-the-art AC2 functionality.

The GBAD future weapon system is based on the premise that no individual command, service, or system will be singularly capable of countering the future air, cruise missile, and manned FW/RW threats. Only air defense units that can employ an integrated, interoperable, and interdependent non-kinetic/kinetic family of systems, leveraging different joint, service, and multinational force capabilities will be successful.

The GBAD FoS replacement system must be capable of countering the expected threat systems (assuming UAS as the primary threat with the secondary threat being cruise missiles and manned FW/RW aircraft).

Core candidate systems under evaluation for the future GBAD FoS include directed energy (high energy lasers), kinetic missiles (AIM-9X and TAMIR), and electronic warfare.

MARINE EXPEDITIONARY ENABLERS:

MARINE AIR COMMAND AND CONTROL SYSTEM (MACCS) AND AVIATION GROUND SUPPORT (AGS) PLAN

MWCS detachments will provide the data communications requirements for a multi-functional C2 node, providing planners more flexibility since data and long-range communications will be internally sourced. Common data supporting shared awareness, automated decision aides, and distributed collaborative planning enables the aviation command and control to link warriors, weapons platforms, and targets, massing desired effects in a timely manner.

The ability to command and control dispersed forces as they aggregate will become a core competency in this new force construct, as highlighted by dispersed forward presence and quick crisis response. **Balanced, expeditionary, multi-functional nodes** are ideally suited to respond quickly to global contingencies and allow the seamless expansion of AC2 as the situation evolves.

AMPHIBIOUS COMMAND AND CONTROL

Our service doctrine emphasizes that the Marine Corps is a critical component of our integrated naval forces, designed to project power ashore from the sea. Our partnership with the Navy enables a forward-deployed and engaged force that shapes, deters, responds, and projects power well into the future. Marine aviation is actively engaged with their Navy counterparts to determine where integration of command arrangements and control functions may best provide a more cooperative and synergistic blue/green solution for the AC2 of MAGTF assets operating afloat. Currently, **CAC2S afloat is fielded on the USS Essex, with a plan to field to all L-Class ships.** This effort will integrate the F-35 with amphibious ships, disseminate information throughout the ship, and make Marine AC2 from the seabase seamless.

The MAGTF commander must possess the ability to command and control his/her forces in support of an ever distributed and increasingly diverse mission set. They also must be able to provide the full range of MACCS capabilities from the sea base during STOM operations.

Marine Corps Aviation and Tactical Air Control Group (TACGRU) leadership recently signed a naval integration Memorandum of Understanding (MOU) that formalizes the agreement to integrate aviation command and control Marines into sea-based operations in order to optimize MAGTF littoral capabilities.



MARINE EXPEDITIONARY ENABLERS:

MARINE AIR COMMAND AND CONTROL SYSTEM (MACCS) AND AVIATION GROUND SUPPORT (AGS) PLAN

Our current lines of effort include aviation command and control Marines attending Tactical Air Control Squadron (TACRON) training to integrate with the Supporting Arms Coordination Center (SACC), Navy Tactical Air Control Center (NTACC) and the Landing Force Operations Center (LFOC) for future MEU deployments. Additionally, Joint Interface Control Officers (JICOs) are augmenting the TACRON staff on MEU deployments while TACRON personnel are attending WTI as Command, Control and Communications (C3) students.

This works the other direction as well: Navy students in Marine Corps schools. To date, **four Navy TACRON students have graduated from WTI**. The goal is to have at least one TACRON member per MEU who is a WTI course graduate. This is required due to advanced aircraft capabilities emerging simultaneously with an increase in disaggregated and distributed operations afloat.

As new Marine aviation platforms begin to field, they will provide more capability and higher fidelity information to ships via new sensors and gateways, enabling such concepts as Sea Shield and Sea Strike. Forward-deployed C2 nodes equipped with CTN, CAC2S and a TPS-80 will contribute fire control quality data to the naval force.

Our sea-based C2 integration will enhance the command relationships and partnerships among the Navy and Marine Corps team afloat. Properly employed MACCS Marines afloat, supported by the right mix of AC2 systems, and working with their naval counterparts will be positioned to process, integrate, and operationalize this myriad of information in support of MAGTF operations.

INTEGRATED FIRE CONTROL (IFC)

IFC is a concept that combines sensors and shooters to address challenging AAW and air defense problem sets. IFC conceptually allows sensors from air, land, or sea to provide high fidelity target data, enabling weapons to be fired from any domain, agnostic of platform.

Through the use of TDLs, composite tracking, and collaborative sensor sharing, the Marine Corps will have the ability to develop fire control solutions from information provided by one or more non-organic sensors. IFC provides several advantages for the MAGTF:

- 1) Reaction time will be decreased** as detection and target information can be provided by both organic and non-organic airborne assets and ground-based radars.
- 2) Combat identification** will be enhanced through the ability to access multiple sensors, providing better context of who is in the airspace.
- 3) Defense-in-depth** will be increased through the use of data from non-organic sensors. This will provide a higher probability of kill due to a better view of the target, thus increasing the depth of defended airspace for the MAGTF.
- 4) Electronic attack (EA) resistance** will be stronger, because weapons systems can rely on multiple sensors for firing solutions and be used at maximum effective kinematic range.

MARINE EXPEDITIONARY ENABLERS:

MARINE AIR COMMAND AND CONTROL SYSTEM (MACCS) AND AVIATION GROUND SUPPORT (AGS) PLAN

DIGITAL INTEROPERABILITY

Digital interoperability is a key component in the creation of ACE combat power and a key goal outlined by our Commandant as we implement the National Defense Strategy. MACCS Marines and systems continue to serve as the integrator and are focused on tactical air and ground command and control systems interoperability. They continue to aggressively pursue advanced capabilities, leveraging a mix of TDL, proprietary waveforms, and commercial protocols.

For the MACCS to be effective for the MAGTF and ACE commander, it requires the capability to coordinate combat operations verbally and digitally using joint standard information exchange standards, such as LINK-16, Joint Range Extension Application Protocol (JREAP), and Variable Message Format (VMF). The **MACCS is the gateway for the MAGTF and joint force commander** and must be appropriately equipped, trained and employed to fuse information from various sources, domains, and network participants in order to achieve decision superiority for the MAGTF and joint force commander.

The MACCS will also be a key component of digital kill chains. Digital requests will flow seamlessly from requesting to approving agency and back down the chain with mission data or reason for denial after adjudication.

End-to-end digital fires will require the DASC and TAOC to serve as gateways/data-forwarders for these digital requests, which will enable the information and the corresponding tracks that are produced in this process to be managed. MACCS agencies will bind all of the elements of the MAGTF and joint force.



CAC2S will implement standardized information exchanges, waveforms, and commercial protocols. This will allow the exchange of relevant, timely, and actionable information between aviation, ground, naval platforms, agencies, and organizations. Through this implementation, operators will have the information necessary to provide informed decisions, accelerate the kill chain, increase situational awareness, and enhance survivability.

To facilitate the development and implementation of standardized information exchanges and employment concepts, VMX-1 AC2 operational test Marines ensure mission-effective exchanges of relevant tactical information during exercises, limited user evaluations, and quick reaction tests.

MARINE EXPEDITIONARY ENABLERS:

MARINE AIR COMMAND AND CONTROL SYSTEM (MACCS) AND AVIATION GROUND SUPPORT (AGS) PLAN

AVIATION C2 FAMILY OF SYSTEMS (AC2 FOS)

As we look to the future, the strategy to modernize the MACCS is synchronized with the arrival of our new, key platforms. The speed, range, and operational flexibility of the MV-22, and the firepower and electromagnetic spectrum dominance of the F-35B, are new capabilities the MACCS, via its own advances, must fully exploit for the MAGTF commander. The AC2 family of systems provides key material enablers that are on-track to field to the operating forces and to modernize the ACE.

The AC2 FoS is a set of related, scalable, modular systems, which the MACCS can arrange or interconnect in various configurations to provide different capabilities. The mix of systems can be tailored to provide desired capabilities, dependent on the situation or mission assigned. The AC2 FoS includes the CAC2S, CTN, TPS-80 G/ATOR, and TPS-59 long-range radar.

COMMON AVIATION COMMAND AND CONTROL SYSTEM (CAC2S)

Program Overview. CAC2S Increment I provides the command and control system to process, display, and distribute air and ground data from sensors, other C2 nodes, and aircraft for the ACE commander to effectively command, control, direct, and coordinate air operations in support of the MAGTF and joint force.

- 1) CAC2S is an ACAT IAC MAIS program, providing aviation command centers, air defense and air support operation centers
- 2) Key Performance Parameters (KPP): net-ready data fusion
- 3) Common hardware, software, equipment, and facilities
- 4) Modular and scalable
- 5) Interoperable with MACCS organic sensors and weapons systems; fosters joint interoperability

ISSUES

CAC2S Increment I is separated into two phases.

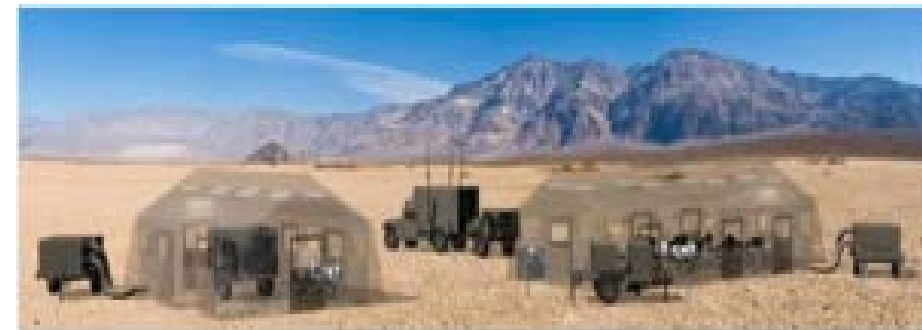
Phase 1, currently fielded, focused on core aviation C2 capabilities. Phase 2, currently being fielded, achieves the full Capabilities Production Document (CPD) requirements of the TACC, TAOC and DASC.

1) Phase 1:

- Combines non and near real-time data to provide a combined air/ground Common Tactical Picture, communications, and operations facility.

2) Phase 2:

- Fuses real-time, near, and non real-time data
- Provides data fusion and sensor integration to TACC/TAOC/DASC
- Provides common hardware and software to TACC, TAOC and DASC



MARINE EXPEDITIONARY ENABLERS:

MARINE AIR COMMAND AND CONTROL SYSTEM (MACCS) AND AVIATION GROUND SUPPORT (AGS) PLAN

UPDATES

Phase 1

- Systems fielded and in sustainment
- Modernized and standardized MACCS capabilities

Phase 2

- Initial (11) systems fielded to MACS units and MCCES: IOC FY17 / FOC FY20-21
- Full production contract awarded for remaining AAO; we expect to field 11 systems in FY19
- AAO (50) Aviation Command and Control Systems (AC2S)
(75) Communication Subsystems (CS)

PERFORMANCE

- 1) Increment I replaces equipment within:
 - TACC (176 seats)
 - TAOC (17 seats)
 - DASC (17seats)
- 2) Operational Impact
 - Provide connectivity between ACE and GCE networks
 - Integrated air and ground picture providing critical battlespace awareness to the MAGTF
 - Sensor network provides real time composite air picture
 - Increases echeloning options between MACCS units
 - Agencies not tethered to sensors

THEATER BATTLE MANAGEMENT CORE SYSTEM (TBMCS)

TBMCS is a Joint Chiefs of Staff-mandated air war planning tool for the generation, dissemination, and execution of air tasking orders and airspace coordination. TBMCS is the primary system utilized for airspace command and control, air support request processing and execution, and provides the link between the ACE commander and the Joint Force Air Component Commander (JFACC). In the future, TBMCS is programmed to be replaced by future aviation C2 and planning software that has recently been placed on the Air Force Pathfinder/Kessel Run program to speed acquisition and streamline software development which may affect USMC acquisition.

This program is intended to develop, field, and sustain modular net-centric command and control applications and web-enabled information that will allow operators to plan and execute joint air operations.



MARINE EXPEDITIONARY ENABLERS:

MARINE AIR COMMAND AND CONTROL SYSTEM (MACCS) AND AVIATION GROUND SUPPORT (AGS) PLAN

COMPOSITE TRACKING NETWORK

Composite Tracking Network (CTN) system provides a sensor netting capability of USMC ground-based radars and U.S. naval surface and airborne sensors through the Cooperative Engagement Capability (CEC) RF network. CTN was specifically referenced as one of our Marine Corps-wide innovation priorities.

CTN provides accurate, composite, real-time track data to the Marine Air Command and Control System and is integral in providing an accurate representation of the airspace for the MAGTF. The primary purpose of CTN/CEC is to provide high fidelity composite track data for integrated fire control engagements.

Issues

- 1) CAB-E array antenna development, procurement and fielding continues through 2019 and will ensure continued connectivity with Navy CEC. CAB-E development and fielding is dependent on Navy's CEC program and must be closely coordinated.
- 2) Developing CTN and TPS-80 NIFC-CA integration.
- 3) TPS-80, CTN and CAC2S need to incorporate additional message sets and conduct integration development and testing IOT use **TPS-80 as a target provider for Navy and Marine Corps NIFC-CA kill chains**. Currently utilizing advanced modeling and simulation to mitigate risk for a future message implementation ECP.

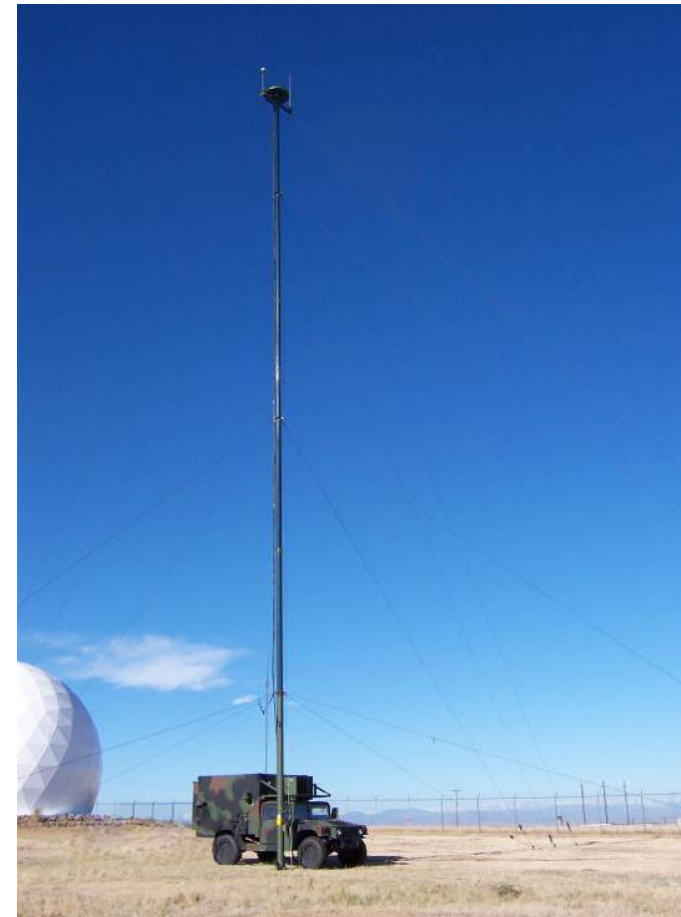
Update

- 1) MS C Decision (Oct 08)
- 2) FOC: FY 16
- 3) Fielded to MACS-1,2,4, 24, MCTSSA and MCCES
- 4) AAO revised from 25 to 10 (Jan 24th, 2014)

- 5) CAB-E Array replacing the CSSA antenna

Performance

- 1) Can establish CTN/CEC network between AEGIS Ships, E-2C/D, TPS-59 and TPS-80.
- 2) Fielding : 10 systems – Currently FOC



MARINE EXPEDITIONARY ENABLERS:

MARINE AIR COMMAND AND CONTROL SYSTEM (MACCS) AND AVIATION GROUND SUPPORT (AGS) PLAN

SENSORS

GROUND AIR TASK ORIENTED RADAR – AN/TPS-80

The Ground/Air Task Oriented Radar (G/ATOR) is a multi-role, ground-based, expeditionary radar that **replaces five legacy radar systems** for the Marine Air Ground Task Force. It is another system the Commandant has referenced as key to our modernization.

The G/ATOR Block 1 replaces the AN/TPS-63 and complements the AN/TPS-59 long range radar; it provides mobile, multi-functional, three-dimensional surveillance of 5th generation aircraft, UAS, cruise missiles, rockets, artillery and mortars (RAM). Of note, **ground forces will receive 28 systems, while aviation units will receive 17. These systems are the same hardware, but with different mission-focused software.**

G/ATOR combined with the Common Aviation Command and Control System (CAC2S) and the Composite Tracking Network (CTN) ensures **no other service is more capable than the Marine Corps in controlling**



MAGTF airspace; it is the foundation for the joint force Air Component Commander's (JFACC's) delegation of airspace to the MAGTF.

- 1) G/ATOR Block 1: Air Surveillance Radar (17 systems).
- 2) G/ATOR Block 2: Ground Weapons Locating Radar for counter fire/target acquisition (28 systems).
- 3) G/ATOR Block 4: Surveillance Radar for Air Traffic Control (12 systems),

Issues

G/ATOR Block 4 (ATC radar, 12 systems via blue dollars) unfunded.

Updates

- 1) IOC: 2018 (Block 1 and 2) FOC: 2024 (Block 1 and 2).
- 2) G/ATOR Block 1 IOC declared in Feb 2018.
- 3) Successful operational assessment conducted October 2017 in conjunction with WTI 1-18.
- 4) G/ATOR Block 2 Operational Assessment May 2018.

Performance

- 1) Detects small radar cross-section air threats (5th Gen A/C, UAS, CM, and RAM).
- 2) Increases MAGTF airspace situational awareness and locates enemy indirect fire positions .
- 3) G/ATOR via CTN contributes to the Navy's Cooperative Engagement Capability in defense of the amphibious seabase.
- 4) Lightweight, rugged and expeditionary.

MARINE EXPEDITIONARY ENABLERS:

MARINE AIR COMMAND AND CONTROL SYSTEM (MACCS) AND AVIATION GROUND SUPPORT (AGS) PLAN

SENSORS

AN/TPS-59A(V)3

The AN/TPS-59A(V)3 is the **primary long range surveillance radar** of the MAGTF, used to support aviation command and control requirements for sustained operations ashore and as part of a joint theater air and missile defense architecture.

It is the Marine Corps' only transportable, solid-state, L-band, long range, 3-dimensional, air surveillance radar able to **track theater ballistic missiles**.

- 1) Fielded in 1985: Upgraded in 1998 (theater ballistic missile capability).
- 2) Upgraded to A(V)3 designation in 2011 to address obsolescence within the Control/Signal Processor Shelter.
- 3) Post production sustainment efforts keep radar viable against threats.
- 4) Contributes to CEC/CTN networks by providing early warning track data.
- 5) Supports ground sensor TBM data requirement to IAMD network via C2 node (Link 16).
- 6) IAMD defense in depth, persistent surveillance-threat detection.

This radar will be sustained until 2035. Incremental Engineering Change Proposals and Tech Refresh Initiatives address Diminishing Manufacturing Sources (DMS) and obsolescence.

Key Sustainment Metrics

- 1) Implement IFF Mode 5 level I per DoD mandates
- 2) Mitigate obsolescence/DMSMS and issues in array power supply, receiver and exciter cabinets and control shelter op/console/servers
- 3) Increase reliability availability and maintainability (RAM)
- 4) Maintain same frequency and signal strength
- 5) MROC Decision in July 2018 to defer all TPS-59 modernization efforts/funding in order to better support emerging capabilities



**MARINE EXPEDITIONARY ENABLERS:
MARINE AIR COMMAND AND CONTROL SYSTEM (MACCS) AND AVIATION GROUND SUPPORT (AGS) PLAN**

Updates

In operations support / sustainment phase of acquisition life cycle

- 1) Post Production Modification II (MK XIIA, IFF Mode 5, and Array Power Cabinet Technical Refresh)
- 2) Antenna transmitter group ECPs
- 3) Radar console/servers tech refresh
- 4) Information Assurance and SW Integration
- 5) MROC Decision; modernization efforts differed

Systems	Unit Location	Quantity
MACS-4	1 MAW	2
MACS-2	2 MAW	2
MACS-1	3 MAW	2
MACS-24	4 MAW	2
MCTSSA	Camp Pendleton, CA	1
MCCES	Twentynine Palms, CA	1
Depot	Tobyhanna, PA	1

Total		11



MARINE AIR TRAFFIC CONTROL

AN/TPN-31A (V) 7

The AN/TPN-31A(V)7 is a fully autonomous Airport Surveillance Radar and Precision Approach Radar (ASPARCS) air traffic control system. When combined with the AN/TSQ-263 Tactical Terminal Control System, it allows the Marine Air Traffic Control Detachment to provide the full range of radar services.

- 1) 2004 Army ORD adopted: ASPARCS over cost and delayed
- 2) 2007 System identified as complementary to legacy MATCALs
- 3) Bridging system until G/ATOR and CAC2S
- 4) Replaced legacy MATCALs with fielding of extended range of version 7
- 5) Rapidly deployable, HMMWV based system transportable with organic USMC assets

MARINE EXPEDITIONARY ENABLERS:

MARINE AIR COMMAND AND CONTROL SYSTEM (MACCS) AND AVIATION GROUND SUPPORT (AGS) PLAN

In Operations Support/Sustainment Phase of Acquisition Life Cycle.

1) Total systems: 15

- IOC – FY07
- FOC – FY13

2) ECP

- Range Extension - In fielding. Increases primary radar range from 25NM and 10,000 feet to 60 NM and 60,000 feet.
- ATNAVICS Tactical Data Link – Receive Only: began fielding in FY16. ECP for two-way, digital interoperability underway.
- Mode 5 – Developed jointly with Army lead. Installation to commence in FY16.

AN/TRN-47(V)2 AIRFIELD MOBILE TACAN

The AN/TRN-47(V)2 Airfield Mobile TACAN (AMTAC) is a highly mobile, rapidly deployable navigational aid, capable of providing **navigational assistance in a GPS-denied environment**. AMTAC provides range and bearing information for navigational assistance and forms the basis of non-precision approaches to a main airbase or air facility.

- 1) Replaces AN/TRN-44, ISO-container based TACAN
- 2) Entire system contained in one trailer
- 3) Power supplied by fielded generators
- 4) Increased deployability with no loss in capability
- 5) Fully redundant, dual transmitter configuration

Currently in development as an ECP to the AN/TRN-47 TACAN

- 1) ECP Part 1 completed in FY16
- 2) ECP Part 2 to commence in 3rd Quarter FY16
- 3) Initial fielding planned for FY19



MARINE EXPEDITIONARY ENABLERS:

MARINE AIR COMMAND AND CONTROL SYSTEM (MACCS) AND AVIATION GROUND SUPPORT (AGS) PLAN

AN/USQ-218 MISSION EQUIPMENT PACKAGE

The AN/USQ-218 Mission Equipment Package, or Tower Remote Kit, provides the necessary equipment to conduct tower operations from host nation towers, existing structures, or purpose built facilities.

The system is comprised of seven two-man lift cases designed to operate up to 200 feet from supporting communications asset. The system interfaces with existing communications assets from the AN/TSQ-120C tower and Remote Landing Site Tower. When combined with the Mobile Terminal Group, it provides significant flexibility and capability for the MAGTF Commander.

Total Systems: 12
IOC: 1QFY17
FOC: 2QFY17



MOBILE TERMINAL GROUP

The Mobile Terminal Group is a HMMWV mounted ATC communication system designed to work with the AN/TSQ-120C ATC tower, the AN/USQ-218 Mission Control Package, and existing host nation ATC Tower structures. This communications system provides the communications assets necessary for controllers to provide all required ATC tower services in accordance with Naval Air Training and Operating Procedures Standardization.

The Mobile Terminal Group replaces the down shelter to the AN/TSQ-120C, and eliminates a requirement for external support to move the system. The system also modernizes the communications equipment, while sustaining the same capability. The system is currently in engineering development.

Total Systems: 12
IOC: TBD



MARINE EXPEDITIONARY ENABLERS:

MARINE AIR COMMAND AND CONTROL SYSTEM (MACCS) AND AVIATION GROUND SUPPORT (AGS) PLAN

LOW ALTITUDE AIR DEFENSE (LAAD)

LAAD battalions are the Marine Corps only dedicated air defense capability to defend the MAGTF against low altitude UASs, cruise missiles, manned fixed-wing (FW), and rotary-wing (RW) aircraft. Marine aviation requires a **replacement weapon system for the Stinger missile**, to mitigate the capability gap versus low observable/low radar cross-section (LO/LRCS) threats (UASs/cruise missiles) and the ability to mitigate threats on-the-move in support of maneuvering units and high value assets. To fill this gap, Marine aviation intends to integrate kinetic (missile/gun system) and non-kinetic (directed energy/electronic warfare) weapons to provide continuous, low altitude air defense of the MAGTF. The GBAD Future Weapon System (FWS) solution, which is now a program of record called the **Marine Air Defense Integrated System (MADIS)** will be fielded in three increments:

GBAD FWS Increment 1 (2021-2025) - Interim GBAD FoS integrated on JLTV consisting of two complementary MADIS variants. Both MADIS variants will have optics, gun and RF defeat C-

UAS system. The MADIS Mk1 variant will turret mount the Stinger missile, which is going through a Service Life Extension Program. The MADIS Mk2 variant consists of C-UAS (Kinetic) and 360 degree radar for low altitude surveillance and fire control against LO/LRCS threats.

GBAD FWS Increment 2 (2027+) - Army and Marine Corps jointly field the Maneuver-Short Range Air Defense (M-SHORAD) Weapons System. M-SHORAD dedicated to defending maneuvering forces by destroying UASs, and FW/RW threats. M-SHORAD BVR kinetic and non-kinetic capabilities **upgrade existing MADIS platforms.**

GBAD FWS Increment 3 (TBD) - Counter cruise missile intercept provides the capability to acquire, track, engage, and defeat the threat to supported forces within fixed and semi-fixed locations against cruise missiles/UASs/manned FW/RW threats.



**Inc 1 MADIS Mk1
(Turret Stinger, gun, EW)**



**Inc 1 MADIS Mk2
(Sensor, C-UAS interceptor, gun, EW)**



**Inc 3 Counter Cruise
Missile Intercept
(launcher)**

**Inc 2 MADIS Mk1
(Missile, gun, EW)**

M-SHORAD kinetic

**Inc 2 MADIS Mk2
(Sensor, Directed
energy, gun, EW)**

M-SHORAD non-kinetic

MARINE EXPEDITIONARY ENABLERS:

MARINE AIR COMMAND AND CONTROL SYSTEM (MACCS) AND AVIATION GROUND SUPPORT (AGS) PLAN

LOW ALTITUDE AIR DEFENSE (LAAD)

The MADIS Increment (0) is being fielded rapidly in response to urgent need requests, with multiple configurations including the MRZR quad vehicle, a fixed-site mast configuration, and the Mine-Resistant Ambush-Protected (MRAP) All-Terrain Vehicle (MATV) platforms. The MATV variant (Figure 2) mounted with the RPS-42 Tactical Air Surveillance Radar, Vehicle Optics Sensor System (VOSS), RF Link-16 capable C2 suite, Skyview RF Detection System, and the MODi RF Jammer to meet the needs for mounted OTM C-UAS operations.

Continued spiral upgrades will add a direct fire gun and C-UAS interceptors onto a modular turret in FY19/20.

L-MADIS (Fig 1) is an MRZR, mounted with the RPS-42 tactical air surveillance radar, small EO/IR camera, Skyview RF Detection system, and MODi RF Jammer. It is the next generation of ultra-light tactical vehicles, and meets the needs of special operations, expeditionary, and light infantry forces.

Also part of the MADIS Inc (0) is the Expeditionary MADIS (E-MADIS) (see Figure 3), a fixed site air defense system. Using MADIS components, it is a modular GBAD system that can be set up in less than 30 minutes to provide C-UAS force protection capability for fixed sites. The system includes the RPS-42 tactical air surveillance radar, which can be set up at a location with a wide field of view with the Skyview RF Detection System, the VOSS, MODi RF jammer, and for C2, the RF Link-16 capability. MADIS provides maximum battlespace over-watch, standoff, early warning, and sensor fusion capability for fixed site security

C-UAS MODi. This system integrates a non-kinetic C-UAS capability in a man-wearable configuration capable of being networked with other electronic warfare to establish a common electronic warfare operating picture.



Figure 1. L-MADIS w/MODi RF jammer and RPS-42 sensor



Figure 2. MADIS in MATV configuration



Figure 3. E-MADIS with RPS-42 and MODi on a rooftop

MARINE EXPEDITIONARY ENABLERS:

MARINE AIR COMMAND AND CONTROL SYSTEM (MACCS) AND AVIATION GROUND SUPPORT (AGS) PLAN

METEOROLOGICAL AND OCEANOGRAPHIC (METOC)

The Oceanographer of the Navy is the resource sponsor for Marine Corps METOC Programs of Record (POR) with funding lines not identified as Blue In Support Of Green (BISOG).

AN/TMQ-56 METEOROLOGICAL MOBILE FACILITY (REPLACEMENT) NEXT GENERATION [METMF(R) NEXGEN]

AN/TMQ-56 is a mobile, fully integrated, FORCENet-compliant tactical meteorological support system. The system delivers relevant, timely METOC sensing, products, and mission impact assessments via Common Operating Picture to the MAGTF and joint force.

- 1) CPD-Approved Acquisition Objective (AAO): 15 modified to 14 per joint letter (CMC/APX-1, OPNAV N2/N6E) of 17 May 2013
 - 11 of 14 systems procured:
 - 9 at MATC Detachments (8 USMC, 1 USMCR)
 - 1 at Program Office (Engineering Design Model)
 - 1 at Technician Schoolhouse (Trainer)
 - Funding shortfall for (3) full systems remains = ~\$14M.
 - This shortfall can be met at a significantly reduced cost by completing the Intelligence Battalion Variant (IBV) at a cost of ~\$2M.
- 2) NEXGEN supported deployments/exercises:
 - Weapons and Tactics Instructor (WTI) Course
 - Large Scale Exercises (LSE)
 - Humanitarian Aid and Disaster Relief (HADR) and Inter Agency support worldwide
 - On-going METOC support to aviation operations around the world.

Issues

CPD: “The Approved Acquisition Objective (AAO) for the METMF(R) NEXGEN is 15 systems; one system to each Intelligence battalion and Marine Wing Support Squadron (MWSS); one training variant to Naval Air Technical Training Unit (NATTU) / Marine Corps Detachment (MARCORDET), Keesler Air Force Base (AFB); and one system to the In-Service Engineering Agent (ISEA).” MWSS systems were moved to Marine Air Control Squadron’s Marine Air Traffic Control Detachments and the Keesler AFB, MS system is now in Pensacola.

- 1) Funding Issues:
 - ~\$2M OP/N for remaining IntelBn Sub-Systems.
 - ~\$9M OP/N for technical refresh and maintenance of system baseline.
 - ~\$0.7M RDT and E AoA for Follow-on System.
- 2) Software/Hardware issues
 - New software implementation requirements coupled with aging hardware continue to result in unfunded costs to an underfunded POR.



MARINE EXPEDITIONARY ENABLERS:

MARINE AIR COMMAND AND CONTROL SYSTEM (MACCS) AND AVIATION GROUND SUPPORT (AGS) PLAN

AN/UMQ-4(V)4 NAVAL INTEGRATED TACTICAL ENVIRONMENTAL SYSTEM – FIELDDED (NITES-FIELDED)

AN/UMQ-4(V)4 consists of three laptops with several peripherals, each designed to perform a different functions but all loaded with the same legacy METOC software. Mission requirements, network availability, and embarkation space will dictate how best to employ the system.

The system requires SIPRNET/NIPRNET connectivity for continuous data ingestion. Not all NITES IV suites are identically configured. The NITES IV system also utilizes an Automated Weather Observation System (AWOS), and INMARSAT/BGAN to provide tailored METOC support capabilities.

- 1) System has been in continuous service by the Marine Corps since 2007.
 - (52) Processor Suites, (46) Sensor Suites /AWOS, and (27) BGAN
- 2) Supported deployments/exercises
- 3) Technical Refresh of Processor Suites conducted in 2018

Issues

Replacement solution, NITES – Next Generation (NITES-NEXT), is a software-only solution with no organic surface sensing capability.

- 1) Last Technical Refresh of Processor Suites scheduled for 2018
- 2) POR sunsetting in 2022 with no surface sensing capability identified.
- CD and I staffing an updated surface sensing requirements letter requesting a solution be identified

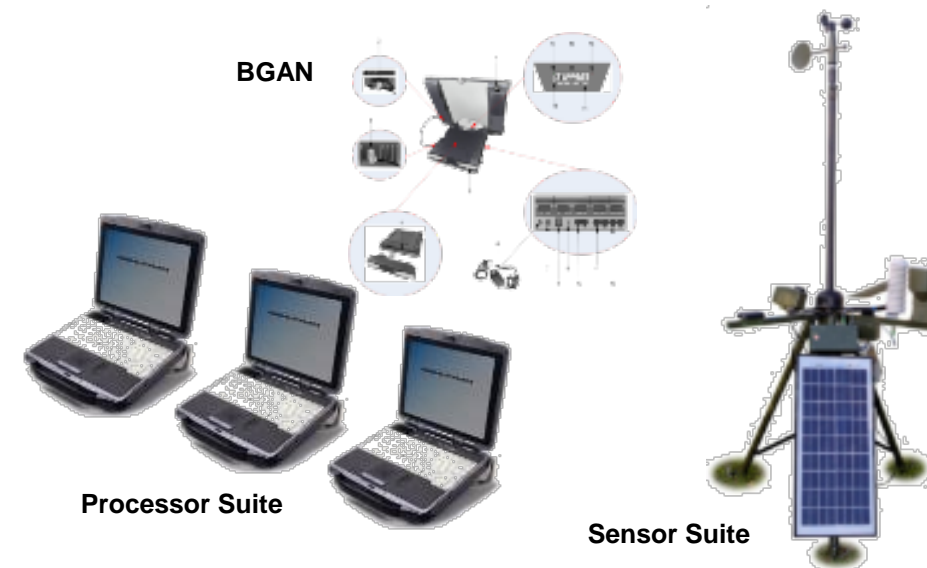
THE WAY FORWARD

The METOC community requires significant changes across DOTMLPF to deliver a METOC capability to the Marine Corps, with expertise in the littorals, that accurately characterizes and exploits the current and forecast METOC environment with actionable information at the horizontal, vertical, and time resolution required to support rapid decision-making.

Initiatives

FY18 work to deliver improved support to the Marine Corps:

- 1) Capabilities Based Assessment
- 2) Professionalization of the METOC workforce
- 3) Readiness reporting of METOC capabilities
- 4) Modernization of capabilities to support information warfare
- 5) Orders development to direct METOC support operations



MARINE EXPEDITIONARY ENABLERS:

MARINE AIR COMMAND AND CONTROL SYSTEM (MACCS) AND AVIATION GROUND SUPPORT (AGS) PLAN

TODAY'S EXPEDITIONARY AVIATION GROUND SUPPORT FORCE

The Marine Wing Support Squadron (MWSS) and Marine Wing Support Detachment (MWSD) serve as our “maneuverable carriers ashore” and provides the functional support necessary to **enable Marine aviation operations in an expeditionary environment**. These capabilities are also relevant to the joint force commander, where forward-basing and the rapid build-up and sustainment of aviation combat power are essential. The ability to maneuver the ACE ashore is critical to the Expeditionary Advanced Base concept set forth in the *Marine Operating Concept*, and in turn supports NDS implementation.

Fulfilling their legislated role as the nation’s force in readiness, Marines are frequently called upon to respond rapidly to an emerging crisis or strategic surprise. Even when engaged in “sustained operations ashore,” such as during our operations in Afghanistan and Iraq, the Marine Corps must retain its capabilities as an agile expeditionary force. An expeditionary force is characterized by **speed and versatility, often in austere conditions**; it must be fully capable of engaging across the ROMO. Whether as a supporting component within a joint force or as a supported joint force, the MAGTF will execute operations and campaigns that range from humanitarian operations and crisis response, to limited contingency operations through major combat operations. Marine aviation can operate from aircraft carriers, amphibious ship or shore-based FOBs. As an extension of sea-based aviation in littoral warfare, FOBs provide the ACE the capability to phase warfighting assets ashore in support of sustained operations.

MWSSs and MWSDs are exceeding expectations across the globe, from Special Purpose MAGTF - Crisis Response missions in Central Command and Africa Command to supporting Marine Rotational Forces – Darwin in Australia. The Marines in MWSSs and detachments are in every clime and place performing the functions of aviation ground support and enabling Marine aviation to complete its assigned mission. Logistics makes us expeditionary.

Planning for the future of AGS continues with modernization of equipment, acquisition of new resources and assets, update of training standards, and the reassessment of core, mission essential tasks. Whether it be the reactivation of the Marine Wing Support Groups’ HQ element, the upgrade of training opportunities, the establishment of alternative MOSs for AGS Weapons and Tactics Instructors, or the development of enhanced equipment and tactics, techniques, and procedures (TTPs) that will enable the MAGTF to maneuver within the littorals to support power projection operations, Marine aviation ground support units will be ready.

AIRFIELD SUPPORT FUNCTIONS

- 1) Expeditionary Airfield Services (EAF)
- 2) Expeditionary Firefighting and Rescue (EFR)
- 3) Aircraft and Ground Refueling
- 4) Explosive Ordnance Disposal

AIR BASE SUPPORT FUNCTIONS

- 1) Essential Engineer Services
- 2) Internal Airfield Communications
- 3) Routine/Emergency Sick Call and Aviation Medical Functions
- 4) Air Base Commandant
- 5) Motor Transport
- 6) Field Messing
- 7) Airfield Security Operations

MARINE EXPEDITIONARY ENABLERS:

MARINE AIR COMMAND AND CONTROL SYSTEM (MACCS) AND AVIATION GROUND SUPPORT (AGS) PLAN

MARINE WING SUPPORT GROUP

The reactivation of the active duty Marine Wing Support Group (MWSG) HQ is required in order to fill an operational command and control gap. This will place a task-organized, effective, and efficient headquarters capable of command and controlling subordinate units with efficiencies gained through logical sharing of personnel and resources. The MWSG will enable increased operational tempo of both the supported and supporting units. The MWSG HQ ensures seamless AGS operations during major combat operations. During FY19, MWSG-27 and MWSG-37 will be reactivated.

MARINE WING SUPPORT SQUADRONS

The MWSS remains the ACE's premier task-organized unit, built specifically to enable Marine aviation operations at the time and location of the commander's choice. Outfitted with a specifically tailored T/O and equipment set, the MWSS maintains the capability to establish, operate and play its role in the security of one main airbase, two forward arming, and refueling points simultaneously. FY 19 will see 8 active component MWSS's, an MWSS (-), two MWSD's and 3 reserve component MWSSs manned, trained and equipped for the future fight.

MARINE WING SUPPORT DETACHMENTS

Marine Wing Support Detachments (MWSD) are task organized to meet the AGS requirement of their supported MAG. MWSDs differ in size and capability depending upon their mission. Currently there are two standing MWSDs; however, task-organizing an MWSD from an MWSS is common practice to support mission requirements.

TACTICAL TRAINING AND EXERCISE CONTROL GROUP (TTECG) AVIATION GROUND SUPPORT (AGS) TRAINING CELL

AGS training cell at MAGTF Training Command Tactical Training and Exercise Control Group provides four AGS "Coyotes" to train and evaluate AGS units. The AGS Coyote cell ensures that AGS units participating in Integrated Training Exercise (ITX) are fully integrated into the exercise and receive the training required to ensure unit readiness. The AGS cell will also help standardize assessments and evaluation of MWSSs. As we introduce new equipment and tactics, training venues for MWSS will continue to evolve and improve, to include:

- Developing the FARP operation into a more robust displacement exercise and adding the complexity of live fire application
- Changing the aircraft recovery event to a non-live fire event to exercise a more realistic scenario with role player injects
- Expanding on the General Engineer Exercise (GENEX) to include air base services, such as expeditionary field kitchen, laundry, and tactical water purification
- Revising the Marine Corps Air Ground Combat Center Order to update manning and equipment requirements to assist with Strategic Expeditionary Landing Field (SELF) turnover during exercises.
- Shaping the SELF improvements to create a more realistic training environment for EXFOR, to include constructing an airfield damage repair (ADR) pad within the SELF and expanding the SELF perimeter to tie into Camp Wilson and Camp Brownfield.

MARINE EXPEDITIONARY ENABLERS:

MARINE AIR COMMAND AND CONTROL SYSTEM (MACCS) AND AVIATION GROUND SUPPORT (AGS) PLAN

The AGS community is actively updating doctrine to meet the rapidly changing future operational environment. The capstone to the effort is MCTP 3-20B, Aviation Ground Support, which is in final editing and is expected to be published this year. In addition, the Mission Essential Task List was updated to accurately reflect the capabilities of an MWSS. In close coordination with MAWTS-1 and the AGS executive steering committee, the AGS community continues to align AGS TTPs with existing and emergent Marine aviation platforms such as the F-35, MV-22, MQ-21, and CH-53K.

Currently there are several significant efforts underway:

- 1. Enabling the concept of distributed operations.** By continually testing and working with T/M/S leads, HQMC and MAWTS-1 continue to refine the required support for this distributed operation template.
- 2. Development of a new concept of employment for airfield damage repair** which will decrease repair cycle times and improve the quality of repairs to ensure faster sortie generation. With the development of this new concept comes an upgrade to the current ADR kit. The new ADR kit will be augmented by a mobile mixer, upgraded tools, new Foreign Object Damage cover, and rapid setting crater fill material.

Additional efforts include:

- 1. DOTMLPF Change Requests continue in the EFR and EAF MOSs to ensure capabilities** (doctrine, training, manpower, etc.) are in place to support the MAGTF when conducting interrelated military activities involving combat, security, engagement, and relief/reconstruction activities in a distributed operations environment.
- 2. Significant progress in the testing of a lightweight matting solution continues.** This effort will enable the ACE to project power and gain access to the littorals in support of the MAGTF.
- 3. Foreign Object Damage (FOD) is a hazard for aircraft operating at airfields and on AM2.** It is imperative that the Marine Corps have the capability to rapidly and safely remove debris from airfields. A FOD mitigation working Group has been stood up to provide an in- depth look at causes and mitigation methods to include training, policies, and equipment modernization.



MARINE EXPEDITIONARY ENABLERS:

MARINE AIR COMMAND AND CONTROL SYSTEM (MACCS) AND AVIATION GROUND SUPPORT (AGS) PLAN

AVIATION GROUND SUPPORT MATERIEL INITIATIVES

EAF LIGHTING UPGRADE (FY19 TO FY22)

Current EAF hard-wire lighting system utilizes 1960-era technology that is maintenance-intensive. We face constant logistical challenges with these systems: the parts are obsolete. We must upgrade this system.

1. The EAF program office (PMA-251) is pursuing updating the obsolete lighting system in an incremental approach by procuring an LED MALSR Approach Light System capable of providing CAT-1 IFR and replacing the current approach and strobe light system.
2. Further enhancements include a high-temp VTOL-taxiway light that is more energy-efficient and durable while eliminating the need for 45W constant current regulators (CCR) and transformers. An improved power and control Infrastructure with a 15kW CCR that integrates a remote control capability is being researched.
3. Commercially available products, to replace outdated precision approach path indicators, wind cones and signage capabilities will be explored.
4. LED technologies will be leveraged to develop and improve runway edge and threshold lights.
5. Improvements to the current expeditious minimal operating landing strip that takes advantage of green technologies is also being pursued.



MARINE EXPEDITIONARY ENABLERS:

MARINE AIR COMMAND AND CONTROL SYSTEM (MACCS) AND AVIATION GROUND SUPPORT (AGS) PLAN

AVIATION GROUND SUPPORT MATERIEL INITIATIVES

LIGHT-WEIGHT MATTING

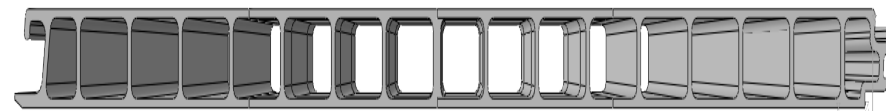
This initiative will develop and field, to the MWSS Expeditionary Airfield Platoon, a light-weight, light-duty matting solution with the threshold objective of supporting MV-22 VTOL/VSTOL, taxiing and parking of fixed-wing aircraft up to KC-130J.

The light-weight matting CDD will also contain the objective requirement to withstand F-35B STOVL operations.



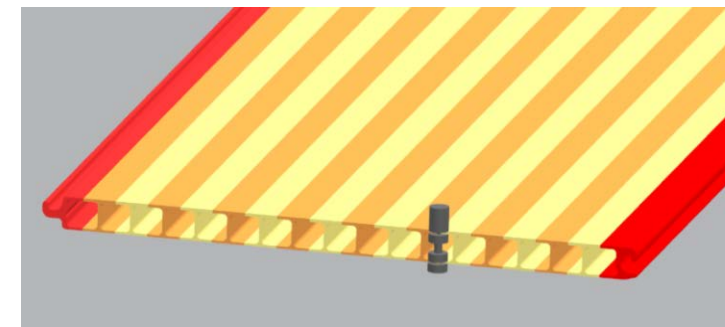
University of Alabama

- Metal solution
- Two-piece core design



Penn State University

- Metal solution
- Individual core extrusions



MARINE EXPEDITIONARY ENABLERS:

MARINE AIR COMMAND AND CONTROL SYSTEM (MACCS) AND AVIATION GROUND SUPPORT (AGS) PLAN

AVIATION GROUND SUPPORT MATERIEL INITIATIVES

AIRFIELD DAMAGE REPAIR

The Marine Corps requires an Airfield Damage Repair (ADR) Kit capable of creating landing surfaces by new construction or repair of existing surfaces. This mission was repeatedly tested during recent operations in Afghanistan and Iraq. The ADR Kit must take advantage of modern developments in construction equipment and materials, be easily deployable, flexible enough to work in all geographic locations and environments, and provide the capability to quickly repair craters and spalls of all sizes.

The required capability for one ADR Kit is to provide the tools and materials to repair six 10-foot diameter craters, in a concrete surface, and/or fifteen 10-foot diameter craters, in an asphalt surface, in less than 92 minutes plus (+) a two hour curing period. One ADR Kit must also contain the materials to repair 45 spalls in a concrete surface.

Concept of Employment

With the ever-changing face of future expeditionary operations, there will be an increasingly significant reliance on the air component of the MAGTF. An airfield damage repair capability that takes advantage of modern developments in construction equipment and materials is key to any expeditious preparation and/or rehabilitation of existing airfields. With the current technology and updated engineering methods that have improved in the past 15 years, the MWSS will possess and maintain a core capability that will **enable the Marine Corps to take advantage of existing airfields** despite damage.

Attributes

Based on requirements, the ADR Kit shall contain all the tools and equipment necessary to provide expedient repairs using established repair techniques covered by an upgraded Foreign Object Damage (FOD) cover or more durable temporary repairs using flowable fill and rapid setting cementitious products.

Key upgrades include:

- 1) Improved lightweight and scalable FOD cover system
- 2) Upgraded tracked skid steered/loader with concrete cutting saw and additional attachments
- 3) Self-contained volumetric mixer



MARINE EXPEDITIONARY ENABLERS:

MARINE AIR COMMAND AND CONTROL SYSTEM (MACCS) AND AVIATION GROUND SUPPORT (AGS) PLAN

AVIATION GROUND SUPPORT MATERIEL INITIATIVES

EXPEDITIONARY FIREFIGHTING AND RESCUE (EFR)

The EFR community continues to refine their training and improve their equipment. From establishing an MCPC for a family of EFR vehicles that incorporates P-19R, quick reaction FARP vehicle, rescue vehicle, and water tanker to the creation of a Family of EFR equipment/ tools sets MCPC.

Fielding of the P-19R began in 3rd quarter of FY17 and is on target for FOC 1st quarter FY20. This initiative replaces the A/S32P-19A Aircraft Crash and Structure Fire Fighting Truck, known as the P-19A. The P-19A was introduced in 1984 with a service life of 12 years and has undergone two depot level rebuilds. The new vehicle is compliant with current National Fire Protection Association (NFPA) standards for aircraft rescue and fire fighting vehicles, resulting in a vehicle optimized for operator and crew safety.



The creation of an EFR MCPC will standardize EFR equipment to include; handheld firefighting, rescue, extraction and salvage equipment, EFR sections will be better equipped with gear that has been researched and developed for their unique requirements of forward deployed aircraft firefighting, rescue and salvage missions.

Training refinements include taking advantage of joint training opportunities available through the Community College of the Air Force and replacing aircraft firefighting simulators.

MARINE EXPEDITIONARY ENABLERS:

MARINE AIR COMMAND AND CONTROL SYSTEM (MACCS) AND AVIATION GROUND SUPPORT (AGS) PLAN

FAMILY OF FOREIGN OBJECT DAMAGE (FOD) MITIGATION EQUIPMENT

The Navy and Marine Corps have operational concepts, based on the National Defense Strategy and National Military Strategy, that prescribe distributed maritime operations, littoral operations in contested environments, and expeditionary advanced base operations. In order for Marine aviation to support these concepts we must be able to operate from main airbases with little infrastructure and multiple distributed air sites.

We estimate FOD incidents will cost the naval aviation enterprise more than \$2 billion in engine replacement and repair cost over the FYDP (2019-2024), with a 10 year cost of \$4.4 billion (2019-2029). Additionally, distributed short take-off and vertical landing operations does not take into account FOD vulnerability of the F-35B engine and there is no plan for engine replacement/repair at austere sites.

Family of Foreign Object Damage (FOD) Mitigation Equipment (F2ME) defines the required capabilities and attributes for a family of systems to reduce/eliminate debris on aircraft operational surfaces.

The current USMC FOD mitigation capability is not configured with adequate equipment to support all United States Marine Corps and joint aircraft. The proposed F2ME will take advantage of the latest equipment and innovative processes that will enable the MAGTF ACE to provide faster and more reliable services in a combat environment. This also makes us more flexible at austere training areas such as Marine Corps Auxiliary Landing Field (MCALF) Bogue and the Strategic Expeditionary Landing Field (SELF) 29 Palms.

The F2ME will be designed to address the current capability gaps associated with the ACE in maintaining operating surfaces at Forward Operating Bases (FOB) and CONUS/OCONUS aviation training sites. This RM incorporates the requirements identified in the DC AVN and DC CD and I EFOD Mitigation Working Group. The F2ME will be used to significantly reduce debris on aircraft operating surfaces that are available for the ACE to provide the six functions of Marine aviation.



MARINE TACTICAL AIR CONTROL PARTY

TACP SUPPORT, TRAINING, AND READINESS

The demand for Joint Terminal Attack Controllers (JTACs), Forward Air Controllers (FACs), and Forward Air Controllers (Airborne) (FAC(A)s), properly integrated with Joint Fires Observers (JFOs), has increased dramatically over the past decade in support of USMC and joint force operations. Their collective fire support capabilities are projected to be a major component of future force design.

Specially-certified and -qualified service members and aviators, from a forward position or airborne, direct the action of combat aircraft engaged in close air support and offensive air operations; act as an extension of the TACP; and perform autonomous terminal guidance operations (TGO). These low-density, high-demand teams are sought after to support the ground fire support plan and have proven absolutely critical to mission accomplishment. Initial certification training for JTACs, FACs, and JFOs occurs through the period of instruction provided by instructors at Expeditionary Warfare Training Group Pacific and Atlantic (EWTGPAC/LANT). The Training and Readiness (T&R) training continuum is facilitated in the fleet by air officers and SNCOs, at the artillery regiments, ANGLICOs, and divisions, who have been designated Weapons and Tactics Instructors (8077 MOS) after completing the Air Officer Course at MAWTS-1.



JTAC / FAC PRODUCTION AND SUSTAINMENT

Currently there is a validated **requirement for 344 active and reserve JTACs and 253 active and reserve FACs for a total of 597 ground-based controllers.**

This need translates to a requirement to produce 279 JTACs annually. Air support requirements for certification and qualification has grown and will continue to be more challenging. Initiatives have been and are in work to mitigate this situation; however, demand for JTACs and FACs continues to grow.

The Marine Corps has incorporated commercial air services to augment USMC fleet aircraft in order to meet the increasing certification and qualification requirements. The current USMC Contract CAS (CCAS) program is dedicated to initial JTAC/FAC training and provides up to 50% of the total FW certification requirements. Future CCAS initiatives will continue to provide initial training in support of the EWTGs as well as augment fleet aircraft support to MAWTS-1 Air Officer Division.

Future TACP program and budget emphasis on high fidelity, linked simulation and CCAS to augment fleet support to TACP training will yield overall proficiency and combat readiness.

The TACP and JFO curricula must strive to collectively incorporate unmanned aviation platforms to increase proficiency with persistent/simultaneous ISR, CAS, and EW for the MAGTF and joint force.

MARINE TACTICAL AIR CONTROL PARTY

JOINT TERMINAL ATTACK CONTROLLER (JTAC, MOS 8002)

A **qualified (certified) service member who, from a forward position, directs the action of combat aircraft engaged in close air support and other offensive air operations.** A qualified and current Joint Terminal Attack Controller will be recognized across DOD as capable and authorized to perform terminal attack control.

- Primary officer feeder MOSs are 0802, 7315, 0302, 1802, 0372 and 1803.
- Primary enlisted feeder MOSs are 0861 and 0321.
- Must be E-5 and above.
- All these MOSs are listed on Unit T/O and T/E with a billet MOS of 8002.
- 0321 and 0372 are given an additional skills designation of 8002 held outside of a billet

FORWARD AIR CONTROLLER (FAC, MOS 7502)

An **officer (aviator) member of the tactical air control party who, from a forward ground or airborne position, controls aircraft in close air support of ground troops.** The Marine Corps is the only service that uses the term, therefore **in the joint community a FAC is a JTAC.**

FORWARD AIR CONTROLLER AIRBORNE (FAC(A))

FAC(A)s are an airborne extension of the Tactical Air Control Party (TACP) which operates as the forward element of the Theater Air-Ground System (TAGS). JP 3-09.3 *Close Air Support* states that current and qualified FAC(A)s “will be recognized across the DOD as capable and authorized to perform terminal attack control”. As defined in JP 1-02, DOD *Dictionary of Military and Associated Terms*, a FAC(A) is defined as “a **specifically trained and qualified aviation officer who exercises control from the air** of aircraft engaged in close air support (CAS) of ground troops.”

USMC FAC(A) Platforms: AH-1, UH-1, FA-18, AV-8, F-35

JOINT FIRES OBSERVER (JFO)

A JFO is a **trained service member who can request, adjust, and control surface-to-surface fires, provide targeting information in support of Type 2 and 3 close air support terminal attack control, and perform autonomous terminal guidance operations.**

In conjunction with a FAC, JTAC, or FAC (A), a JFO can facilitate a CAS attack **up to the clearance of fires.** Clearance must be provided by a FAC, JTAC or FAC (A) who might not be co-located with the JFO but who has situational awareness to control the attack.

The objective is to have at least one (1) JFO at each rifle squad who will act as a key component of the JTAC-JFO terminal attack controller team.



MARINE TACTICAL AIR CONTROL PARTY

WEAPONS AND TACTICS INSTRUCTOR (WTI, MOS 8077)

A **SNCO or officer graduate of the MAWTS-1 Weapons and Tactics Instructor Course** gains the designation as a Weapons and Tactics Instructor (WTI).

A WTI has completed the transformation from an individual trained in terminal attack control to an experienced aviation integration training manager and JTAC Evaluator.

Each **Regimental and MEU Air Officer and ANGLICO Company Air Officer shall attend the Air Officer Course and be certified as a WTI.**

At the regimental and MEU level, WTIs shall supervise the development and implementation of subordinate unit collective and individual aviation integration training and shall facilitate the training and evaluation of adjacent units. (MCO 1301.25C)

Weapons and Tactics Instructors provide a capability to fill associated operator force billets to develop and execute a unit training program in accordance with the Weapons and Tactics Training Program (WTTP). This training is focused on achieving individual training and readiness through collective operational unit training.



FAC Requirement

Unit Type	Distribution	A/C	R/C
Infantry Bn	24 A/C Bn 8 R/C Bn	72	24
LAR Bn	3 A/C Bn 1 R/C Bn	9	3
Tank Bn	2 A/C Bn 1 R/C Bn	6	3
Recon	3 A/C Bn 1 A/C Bn	3	1
Force Recon Co	3 A/C Co 1 R/C Co	3	2
ANGLICO	3 A/C Co 3 R/C Co	21 (3)	27
MARSOC		21	1
Artillery Regt	3 A/C 1 R/C	3	1
Higher HQ: Inf Regt MEU	8 Regt x 2 7 MEU x 2	16 14	2
MAWTS/EWTG		4	
Other		9	5
	TOTAL	184	69

Total TAC: 715 (568 AC / 147 RC)

JTAC Requirement

Unit Type	Distribution	A/C	R/C
LAR Bn	1st LAR: 5 2d LAR: 5 3rd LAR: 5	15	1
Artillery Reg HQ	10th MAR: 12 11th MAR: 10 12th MAR: 5	27 (1)	N/A
Artillery Bn	10th MAR: 21 11th MAR: 36 12th MAR: 9	66	N/A
Recon	1st Recon: 3 2d Recon: 3 3rd Recon: 3	9	N/A
Force Recon	1st Force: 5 2d Force: 5 3rd Force: 13	23	N/A
ANGLICO	1st ANG: 12 2d ANG: 12 5th ANG: 12	36 (3)	60
MARSOC		42	N/A
MAWTS/EWTG		5	N/A
Other		39	17
	TOTAL	266	78

JFO Requirement

Unit Type	Distribution	A/C	R/C
Infantry Bn	27/ Inf Bn	648	243
LAR Bn	1/Plt	27	18
Tank Bn	1/Plt	10	23
Artillery	3/FO Team	216	42
	2/NGF Liaison Section	12	N/A
	HQ BTRY (LAR/Tanks)	26	N/A
Force Recon/ Recon	1/Team	111	60
ANGLICO	24/ Co	72	108
	TOTAL	1122	494

FAC(A) Requirement

Unit Type	Distro	CMMR	FAC(A)
HML/A	7 HML/A 3 x W/Y 4 x Y/Z	6 x H-1W 6 x H-1Z 4 x H-1Y	70
VMFA(AW)	4 Sqdn	6 FAC(A) crews per Sqdn	24
VMFA	7 Sqdn	2 FAC(A) per Sqdn	14
VMA	5 Sqdn	2 FAC(A) per Sqdn	10
	TOTAL		118

MARINE TACTICAL AIR CONTROL PARTY

EQUIPMENT

TARGET HANDOFF SYSTEM (THSv2)

THSv2 enables operators to conduct target acquisition and target hand-off to fire support agencies using existing and planned communications equipment to support maneuver units of the Marine Air Ground Task Force. Operators are able to accurately determine and designate a target's location and then digitally transmit (hand-off) target data to supporting arms elements. The primary operators are FACs, JTACs for CAS, forward observers (FO) and joint forward observers for field artillery missions. Tactical air control parties often employ THSv2 in conjunction with intelligence, surveillance and reconnaissance assets.

COMMON LASER RANGE FINDER (CLRF)/VECTOR 21

The Common Laser Rangefinder - Integrated Capability (CLRF-IC) will combine the components of the current CLRF in to a smaller lighter device. **Fielding for the CLRF-IC began in 2016. Fielding to be complete by FY20.**

PORTABLE LASER DESIGNATOR RANGEFINDER (PLDR)

The PLDR replaced the interim laser designator, the Ground Laser Target Designator (GLTD) II. The PLDR provides a laser designation capability out to 5000m at a reduced weight than previous lesser equipment. Redistribution of PLDRs and GLTD IIs is continuous to ensure units have a laser designation capability until production can increase to expected rates.

SITUATIONAL AWARENESS AND NIGHT VISION

AN/PVS-17/14

The AN/PVS-17 provides extended range night vision capability. AN/PVS-14 is issued as a component of the Vector 21.

THERMAL LASER SPOT IMAGER (TLSI)

The Kollsman TLSI with Enhanced Targeting Sight provides the capability to see the laser spot generated by the FAC/JTAC's laser designator or a self-lasing aircraft as well as providing thermal imaging capability. **Fielding is complete.**

VIDEO SCOUT (VS)

Video Scout continues to be the standard for COC video downlink operations. The Remote Video Viewing Terminal (RVVT) is undergoing a requirements rewrite that will affect the procurement of a COC video receiver capable of allowing multiple users to subscribe to multiple video signals received on a local network. The intent is to maintain a technical family of systems approach for the non-static operator (THS operators) and static operators (COC operators). The Man Portable Video Downlink Receiver, SIR 2.5, **started fielding in June 2016** with a total Authorized Acquisition Objective (AAO) of 384 systems.

MARINE TACTICAL AIR CONTROL PARTY

TACP PRIMARY EQUIPMENT : PRESENT



TACP PRIMARY EQUIPMENT: FUTURE *



Next Generation Hand Held Targeting System (NGHS)

		CLRF IC Strategy Approach																															
Fiscal Year		FY17				FY18				FY19				FY20				FY21				FY22				FY23				FY24			
Quarter		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
CLRF		[Timeline bars for CLRF from FY17 Q1 to FY20 Q4]																															
CLRF IC		[Timeline bars for CLRF IC from FY17 Q1 to FY24 Q4]																															
CLRF-IC ECPs		[Timeline bars for CLRF-IC ECPs from FY18 Q1 to FY22 Q4]																															
NGHS		[Timeline bars for NGHS from FY19 Q1 to FY24 Q4]																															
TLSI		[Timeline bars for TLSI from FY17 Q1 to FY22 Q4]																															
PLDR		[Timeline bars for PLDR from FY17 Q1 to FY20 Q4]																															
LMM		[Timeline bars for LMM from FY19 Q1 to FY22 Q4]																															
JTAC LTD		[Timeline bars for JTAC LTD from FY17 Q1 to FY19 Q4]																															

- The Marine Corps continues to evaluate systems and to equip TACPs to this end state. Increased PRC-117G and SIR 2.5 AAOs will help ensure systems critical link in the digitally interoperable MAGTF are fielded to the lowest levels for training and execution.
- All systems should seek to integrate with joint and airborne systems such as SRP to enable full end-user interface and capability.

MARINE TACTICAL AIR CONTROL PARTY

TACP AND TABLETS

Android tablets enable situational awareness and Digitally Aided Close Air Support (DACAS), with applications like Kinetic Integrated Lightweight Software Individual Tactical Combat Handheld (KILSWITCH) in THSv2. The combination of Government Off-the-Shelf (GOTs) and Commercial Off-the-Shelf (COTs) solutions is a model example of rapid innovation in support of our warfighting requirements.

Fielding of THSv2 provides the warfighter with VMF DACAS/Fires capability. Link-16 and Net Enabled Weapon interoperability is planned in future software upgrades.



FIXED-WING LIGHT ATTACK EXPERIMENTATION

The Marine Corps continues to participate in and assess the Air Force-led Light Attack Experiment to procure a cost-effective, observation and attack air platform for employment in permissive environments and more efficiently support recurring CONUS based training requirements. The program will inform a potential procurement decision.

These aircraft could generate readiness for the GCE by supporting JTAC training requirements in WTI, EWTGLANT, and EWTGPAC CAS events, allowing for the currently sourced FW events to be used for other FW required readiness events.

ACE readiness requirements could also be increased in support of FW and RW FAC(A) Training and Readiness events.

If we procure these systems, Marine Fixed-Wing Light Attack could also deploy forward, to reduce the demand signal for USMC TACAIR. The additional asset for deployment enables USMC TACAIR squadrons to prepare for other deployments in contested environments, and allow more expeditionary aircraft to maintain the UDP/MEU schedules.



MARINE AVIATION SYNTHETIC TRAINING

CRITICAL ISSUES: RANGE CAPABILITY, CONTINUED AVIATION TRAINING SYSTEM (ATS) PLAN

The USMC Aviation Training System (ATS) integrates Marine aviation training processes and structures into a single, integrated training system; links training costs with readiness; and spans all Marine aviation communities.

A properly-integrated training system requires evolving institutionalized processes that support our missions and provide on-time delivery of tactically relevant training. With Training and Readiness (T&R) as its foundation, ATS provides the Marine Air Ground Task force (MAGTF) commander with core and mission skill- proficient combat ready units.

ATS FOCUS

ATS integrates processes and programs for training that institutionalize “operational excellence” across Marine aviation. “Operational excellence” involves increased combat readiness and preservation of personnel and assets – risk mitigation through reduction in mishap causal factors from supervisory, procedural, and human error. T&R manuals are source documents for implementing ATS. ATS is intended to:

- Provide operational commanders with a current, responsive and relevant training system for aircrew, aircraft maintenance, aviation ground support and Command and Control (C2) personnel.
- Develop a holistic training system across every Marine aviation community throughout the training continuum that supports aircrew (pilot/NFO/enlisted), operators and maintainers.
- Help proliferate standardization within the Marine aviation communities.
- Develop concurrency management processes to ensure the training system (curriculum, courseware and training devices) remains relevant.

- Address training and safety issues through SAT derived curricula and improved use of Risk Management (RM) and Crew Resource Management (CRM) principles.
- Utilize Marine Aviation Training System Sites (MATSS) to facilitate the ATS program.

ATS PROCESSES

ATS is process-intensive and includes the following:

Flight/Combat Leadership Standardization and Evaluation (FLSE): process of training toward and achieving certifications, qualifications and designations consolidated and standardized, under the MAW ATS structure in accordance with platform and community T&R Manuals and the MAWTS-1 governing Program Guides. It is applicable to both flight leadership and non-aircrew certifications, qualifications, designations, contract instructor (CI) certifications, Naval Air Training and Operating Procedures Standardization (NATOPS) Instrument training and evaluation, as well as recurring generic training such as Instrument Ground School (IGS), Crew Resource Management (CRM), Risk Management (RM), and basic Navy Occupational Safety and Health (NAVOSH) or Naval Aviation Maintenance Program (NAMP) training.

Concurrency Management (CCM): process whereby a change in tactics, aircraft/operational systems configuration, publications or procedures is evaluated to identify the impact of the change on T&R requirements. The T/M/S Simulator Essential Equipment Support Matrix (EESM) is an MCO 3500.14 mandated requirement that helps identify, track, and report simulator shortfalls. Once highlighted, appropriate and timely changes are made to curricula, courseware, and devices to ensure alignment with operational systems and doctrine.

MARINE AVIATION SYNTHETIC TRAINING

The TMS tracks T&R progression and helps commanders ensure that training is conducted in accordance with appropriate orders and regulations; currency and qualification requirements are met; and RM principles are properly applied. The TMS for aircraft maintenance training is the Advanced Skills Management (ASM). Marine Sierra-Hotel Aviation Readiness Program (MSHARP) is the authorized aviation training management system to be used to track all training governed by aviation T&R manuals. The only exception is F-35B, which utilizes the Autonomic Logistics Information System (ALIS). An LMS functions as an electronic repository of specific courseware and technical manuals. The LMS for Marine aviation is the Marine Corps Aviation Learning Management System (MCALMS). The ATS website serves as a CAC enabled portal for access to other resources and training information management systems such as the LMS.

ATS/MATSS MISSIONS:

ATS Mission: Provide resources, processes and policies that deliver a standardized, responsive, cost effective and integrated training system focused on tactically relevant training in order to provide combat ready aviation capabilities to the MAGTF and joint commander.

MATSS: The primary focus of each MAW's ATS is the Marine Aviation Training System Site (MATSS). It directly supports execution of ATS functions for the fleet. While ATS as a whole is process-intensive, the MATSS is resource- and product-intensive. ATS resources available at the MATSS include simulators and training devices, web-based training and learning management systems, academic courseware, electronic classrooms, and the military, civilian and contractor manpower to support, analyze, and provide input to improve training system performance. With increased ATS awareness, the ability to leverage common solutions, coordinate and pool critical resources, and support combat leadership development across the various platforms and communities has improved exponentially. The result is two-fold: significant cost savings and cost avoidance by using a robust SAT process by freeing funds for other requirements, and an enhanced

training capability that substantively increases reportable combat readiness across Marine aviation and the MAGTF.

TRAINING FUTURE / SUMMARY

For Marine aviation, ATS is risk mitigation that presents a game-changing opportunity. The USMC ATS MATSS shall be staffed with high quality uniformed FLSEs, Weapons and Tactics Instructors, and strike fighter tactics Instructors, as well as GS and contractor civilian support (device operators, fielded training system support personnel, contract instructors in support of all FRS and FRD activities) to ensure the functions of ATS are carried out with success and overall combat readiness is improved across the MAGTF.

MCASMP REQUIREMENTS

All new simulators function as a system of tactically relevant networked trainers. All new simulator procurements shall be compatible with this Simulator Master Plan at a minimum. The following are standing requirements:

- 1) CONUS bases: one section of networked simulators
- 2) OCONUS and reserve bases: minimum of one simulator
- 3) Marine Corps Common Visual Data Base (MCCVDb) via Navy Portable Source Initiative (NPSI) and in the future be able to run a USMC Common Synthetic Training Area (CSTA)
- 4) Tactical Environment (TEEn), one per flight device : threat, emitters, emissions, weapon fly-outs, USMC and joint air/ground interoperability
- 5) Common hardware approach across all T/M/S and community simulators to ensure a high fidelity, cross domain, platform and community distributed mission networked training capability is possible with other MAGTF and joint entities.
- 6) Developed IAW current and/or draft T&R, Maneuver Description Guides (MDG), and NATOPS manuals

MARINE AVIATION SYNTHETIC TRAINING

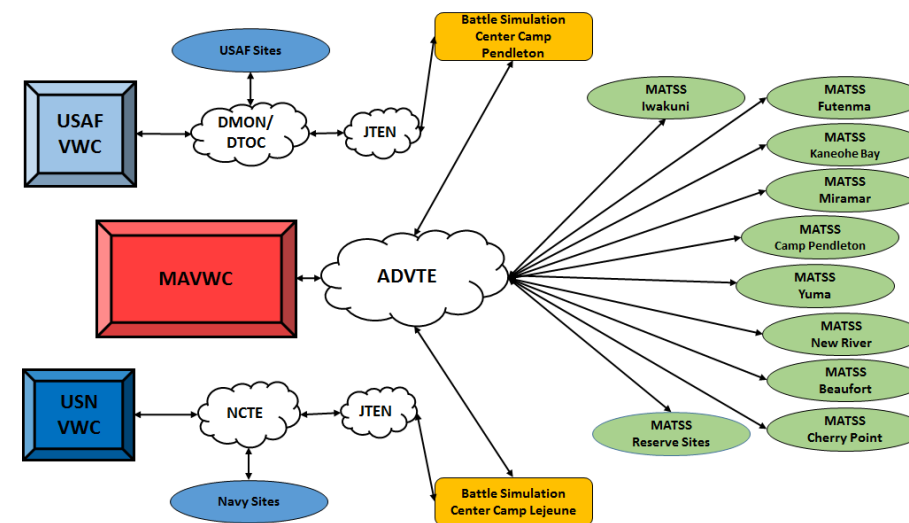
The Marine Aviation Virtual Warfighting Center (MAVWC) construct will bridge the gaps between live and synthetic training for groups as small as detachments to as large as a Marine Expeditionary Force Air Combat Element (ACE). The MAVWC will be Marine aviation's large-scale warfighting center that has the capacity to train numerous units simultaneously using detailed scenario-based missions to achieve the highest possible level of collaborative training and operational integration.

It will provide for maneuver space in training and mission rehearsal for Marine aviation combat units. It will allow for networked similar and dissimilar simulators/training devices, both co-located and geographically separated, in order to support Marine Corps T&R event training/mission rehearsal, ultimately achieving exponentially increased combat readiness.

- 1) Provides a foundation for the integration and interoperability of aviation and ground simulation to achieve true Marine Air Ground Task Force (MAGTF) Live Virtual and Constructive (LVC) training per the United States Marine Corps Commandant's FRAGO 01-2016.
- 2) Tactics, test, and fleet units will be able to develop new or improve TTPs in which to counter existing or developing threats.
- 3) System Integration Laboratory (SIL) capabilities co-located with simulators/training devices can assist in the development and testing of future aircraft and weapon system integration and interoperability.
- 4) Increase current and future readiness at the MAGTF level by increasing repetitions and sets in the most challenging and dynamic environments.

The MAVWC will create a Virtual Warfighting Center on par with the Air Force (Nellis AFB) and the Navy (NAS Fallon) collocated with MAWTS-1. The capability to conduct large-scale (various units) aviation training events to facilitate integrated training will allow the Fleet Marine Force

to become more collaborative in T&R training, thereby improving their combat readiness proficiency. It will allow for increased risk taking using aggressive risk management to execute the mission safely, emphasize higher order cognitive processes in complex full spectrum operations, and enable rapid decision-making and effective C2. This will ultimately allow a commander to evaluate a units performance in following commander's intent, mission accomplishment, and the determination of mission critical success factors. Realistic training tools, models, and simulations enable the capability to practice the collaborative planning, decision-making, and execution processes and procedures. MAVWC training will provide high quality realistic, MAGTF level training that is essential to ensure future Marine forces are adequately trained to conduct the six functions of aviation and maintain the highest level of combat readiness.



MARINE CORPS RANGES

Marine Corps Ranges and Training Areas (RTA), and their associated airspace, are institutional training assets that enable individual Marines and units from fire teams through the most complex Marine Air-Ground Task Force (MAGTF) to achieve, sustain, and enhance combat readiness. The management of Marine Corps RTAs provides for a portfolio of capabilities and scope that fully support required training tasks, events, and exercises across the training continuum in both live and non-live fire environments, utilizing those weapons, platforms (e.g., vehicles, aircraft, etc.), and systems (e.g., equipment, sensors, etc.) in the Marine Corps inventory.

RTA planners employ Regional Range Complex Management Plans (Regional RCMPs) to achieve and maintain the cutting edge of MAGTF training requirements and identify innovative means in which to implement and develop training scenarios.

These plans accommodate current and future training scenarios that meet the operating forces' military mission footprint for readiness. **The RTA Management program provides the Marine Corps with a comprehensive, fully developed program that defines current, emerging, and future range requirements.**

SUSTAIN RANGE AND TRAINING SYSTEM CAPABILITIES

The Marine Corps has made significant investments in RTA infrastructure within the past decade. Sustaining these capabilities is the foundational pillar of the RTAM Program. Some of these supporting institutional efforts include: Ground Range Sustainment Program, Operational Range Clearance, Base Operating Support (BOS) and Facility Sustainment, Restoration and Modernization . Since every Marine Corps range is different, each range project is scoped specifically to provide the best training at that site given and operational constraints. What may appear to be a simple added

capability, may actually be a non-organic dependent and highly complex operation for support and execution. In partnerships with Naval Facilities (NAVFAC), Deputy Commandant for Installations and Logistics (DC I and L) Facilities Branch (LF), Deputy Commandant for Aviation and other Marine Corps and sister service strategic partners to help ensure that these enhancement, capabilities, and modernization programs are employed in consonance with the RTA Management Program to ensure that MAGTF's requirements are met. Additionally, efforts are made to ensure that the Marine Corps RTA Management Program is collaborative and cooperative with the other services ranges and their training/support capabilities.

MAXIMIZE TRAINING CAPACITY

The Marine Corps' greatest challenge in supporting live training is providing sufficient land and air range space to accommodate the training requirements of modern weapons, tactics, and force structure in an effective and efficient manner. A well-managed and operating Marine Corps Range system is the key to maximizing the capacity, quantity, and quality of training given limited range resources.

MODERNIZE RANGES

Range modernization focuses on addressing gaps in range capability that negatively impact training, and providing capabilities to support emerging requirements of new systems or missions. Modern RTAs and supporting equipment (e.g., targets, threats, emitters, etc.) are integral to ensuring our aviation forces are adequately prepared. The only place and manner in which Marines can prepare to face a near-peer competitor for the high-end fight, fully integrated as a MAGTF, is on a fully instrumented range with sufficient space to operate their weapon systems (e.g., vehicles, aircraft, weapons, etc.) at the leading edge of the envelope and at full speed both in the air and on the ground.

MARINE CORPS RANGES

Marine Corps Installations Command (MCICOM) supports aviation's operating forces and combat readiness through myriad aviation support functions at the installations. Ultimately, these functions provide active duty and civilian personnel, support equipment, and training capabilities at all of the Marine Corps Air Stations CONUS and OCONUS which are crucial enablers to the warfighters, adding value and achieving improved daily readiness in the MAGTF. These functions include the below.

MCAS NAVAL AIR TRAFFIC CONTROL, AIR NAVIGATION AIDS AND LANDING SYSTEMS (NAALS) EQUIPMENT

Automated Surface Observing Systems (ASOS)

A surface weather observing system managed by the National Weather Service (NWS), the Federal Aviation Administration (FAA), and the Department of Defense (DOD). ASOS is designed to support aviation operations and weather forecasting.

The Instrument Landing System (ILS)

The Instrument Landing System (ILS) provides azimuth, elevation, and range information to ILS capable aircraft for pilots by radio signal to allow a precision landing during periods of poor visibility or adverse weather conditions.

Tactical Air Navigation System (TACAN)

The TACAN system provides properly equipped aircraft with slant range, bearing, and the identification to the air station.

Digital Airport Surveillance Radar (DASR)

The AN/GPN-30 Digital Airport Surveillance Radar (DASR) provides both primary and secondary radar coverage for terminal air traffic control. The primary surveillance radar coverage is airport surface to 24,000' AGL with 360 degrees of azimuth and a range of 0.5 to 60 nautical miles (nm) from the radar site. The Secondary Surveillance Radar (SSR) provides range coverage to 120 nm from radar site up to 60,000 feet AGL.

Precision Approach Radar (PAR)

The AN/FPN-63(V) Precision Approach Radar (PAR) provides azimuth, glide path, and distance information to pilots during the final approach phase of flight. ATC Controllers provide corrective turns to align inbound aircraft to the runway extended centerline and rate of descent instructions in relations to predetermined glide path to enable pilots to make a stable approach during reduced visibility.

MCAS AIRFIELD EQUIPMENT

Vertical Short Takeoff and Landing Optical Landing System (VSTOL OLS)

The shore based trainer Vertical Short Takeoff and Landing Optical Landing System (VSTOL OLS) guides the aircraft during the landing approach along a 3° descent glide slope to a position 50 feet above the simulated flight deck at the aft end of the simulated ship over the Tram line. At this point the pilot transition to the Hover Position Indicator (HPI) for landing.

Improved Fresnel Lens Optical Landing System (IFLOLS)

The Shore-based Improved Fresnel Lens Optical Landing System (IFLOLS) is a trailer-mounted of Mark 14 Mod 0 shipboard system for Field Carrier Landing Practice. The IFLOLS is placed on a concrete pad located adjacent to the runway, set-up and aligned for operation

E-28 Emergency Runway Arresting Gear

E-28 Emergency Runway Arresting Gear installed to safely arrest tail-hook equipped aircraft in the event of an aborted takeoff or emergency landing.

at an ashore airfield. The kinetic energy of the arrested aircraft is absorbed by the rotary hydrodynamic arresting engines. The arrestment is entirely automatic. These systems are on a 15-year replacement cycle.

MARINE CORPS RANGES

CRITICAL ISSUES: MITIGATING ENCROACHMENT

Marine Corps installations are in littoral areas and sensitive desert environments, making them among the most heavily encroached RTAs within the Department of Defense (DoD). Continued population growth in surrounding communities, increased environmental regulations and reporting responsibilities, rapidly expanding suburban and recreational development, the increased demand for more public communications capabilities, and the mandated emphasis on the use of renewable energy generation further constrain these scarce RTA resources - land, airspace, water space, Electromagnetic (EM) spectrum. These resources are critical to supporting the training requirements of modern weapons, tactics, and organizational force structure movement and operations in a designated safe area. **Any loss of range capabilities from encroachment in these RTAs can and will have a deleterious effect on Marine Corps Combat readiness.**

The Marine Corps relies on its Mission Sustainment Program to prevent, repair, and mitigate encroachment and enhance the overall mission readiness of the Marine Corps while still meeting the requirements to preserve and sustain the natural environment. Local and regional partnerships through the Encroachment Partnering Program (EPP) allow for the purchase of easements surrounding Marine Corps RTAs and underneath airspace and training routes in order to prevent incompatible land uses, offering practical and permanent solutions to preserve RTAs and airspace. Regional partnerships and continuous stakeholder engagement are also important in protecting the Marine Corps ability to use other Services' ranges and non-DoD lands (commonly referred to as "white space") such as Bureau of Land Management (BLM) designated areas (e.g. areas in and around NAS Fallon). One significant encroachment concern of note, is the pressure to develop domestic energy resources and supporting transmission infrastructure both on-

and offshore. Development of commercial wind, solar, geothermal, oil and natural gas resources will require close attention, creative planning, and proactive effort to ensure the Marine Corps' access to RTAs is not degraded and that they do not represent a threat to established arrival and departure routing of aircraft.



The Marine Corps is implementing a robust mission compatibility evaluation process and coordinating across the DoD through the DoD Siting Clearinghouse to address conflicts with energy development. However, the Marine Corps must expand its partnering and stakeholder engagement, update installation and regional encroachment control plans and studies, such as Air Installation Compatible Use Zones (AICUZ) and Range Compatible Use Zone (RCUZ) studies, the development of new mission sustainment tools and policies to ensure access to critical spaces beyond range boundaries, and keep encroachment management efforts aligned with current, emerging, and future RTA and airspace requirements.



MARINE CORPS RANGES

CRITICAL ISSUES: RANGE CAPABILITY

While continued analysis and the fielding of new systems may identify new requirements (both implied and derived), the Marine Corps has identified the following critical deficiencies associated with projected operational range requirements:

Marine Corps RTAs lack the capability to fully exercise a large MAGTF in a realistic, doctrinally appropriate training scenario event/exercise. Specifically, the Marine Corps Air Ground Combat Center (MCAGCC) at Twentynine Palms, CA, as the Center of Excellence (COE) for developing and executing combined arms live-fire training for the MAGTF; it cannot accommodate a full-scale, live-fire Marine Expeditionary Brigade (MEB) exercise. The expansion of MCAGCC, with significant congressional support, will correct Training and Readiness (T&R) deficiencies and significantly enhance the Marine Corps' ability to provide fully-capable MAGTFs in pursuit of Combatant Commander Directives and National Security objectives. The Marine Corps is still negotiating issues with the airspace above the expanded lands, which currently limits their use. The I Marine Expeditionary Force (I MEF) successfully conducted a major large-scale exercise in the summer of 2017, with only adequate land space for the size and scale of the exercise.



A combination of factors that include population increases, littoral stressors, national/international political influences, and our national defense posture have left Marine Corps RTAs in Hawaii and Okinawa with insufficient capabilities to fully support training for their assigned units. To meet this challenge, the Marine Corps is transitioning its capability through a series of real estate and force management actions intended to enhance capability, increase training flexibility (i.e. hours of operations, limitations on scale of operating forces, etc.), and better defined training support to satisfy the Operating forces' requirements. Currently, these operating force units must satisfy their training requirements utilizing various other Military Service facilities. As the number of operational flying squadrons at MCB Hawaii increase, and some training capabilities are lost due to renewable energy development conflicts (i.e. the installation of large onshore and offshore wind turbines), it will be a constant challenge to de-conflict the various Military Service missions to ensure Marines receive adequate training opportunities to achieve proficiency in individual and unit combat skills, tactics, and operations. In a separate action, U.S. Pacific Command (PACOM), with the Marine Corps as the Executive Agent (EA), is proposing developing new unit and combined arms training range capability and capacity in the Commonwealth of the Northern Mariana Islands (CNMI). These ranges and their associated airspace will provide additional training opportunities for Marines stationed in Okinawa and forward deployed to the Western Pacific.

MARINE CORPS RANGES

CRITICAL ISSUES: RANGE CAPABILITY, CONTINUED

The Marine Corps identified the need for an aviation training range on the East Coast of the United States capable of supporting Precision Guided Munition (PGM) training. To meet this gap, the Marine Corps acquired operational control of Townsend Bombing Range (TBR) which has been expanded to a full 35,000 acre facility.

This land acquisition project enables the MAGTF to have unfettered access to a premiere range complex that will meet 100% of the F-35 training squadron needs. We plan for FOC in December 2019, while coordination with the Federal Aviation Administration on the airspace expansion is ongoing.

Bringing the fight from the sea and operating in the littoral is a core Marine Corps competency. The Marine Corps is committed to preserving and enhancing the capabilities of its primary amphibious training bases at Camp Pendleton and Camp Lejeune, and to developing opportunities for increased littoral training in Hawaii. The maneuver corridors, training areas, and airspace required to adequately support ground and air maneuver inland from landing beaches are severely constrained. Addressing these constraints with extensive, exercise-specific mitigation measures is a priority and is currently under study.

FUTURE CAPABILITY OUTLOOK

RTA capabilities to continue to evolve in support of the tenets of our service. Meeting the demands of the operating forces for RTAs requires adequate and consistent funding for range sustainment, services, required modernization efforts, and the full and successful completion of critical projects to correct known T&R deficiencies. Failure to realize key initiative objectives introduces unacceptable enterprise risks that require the Marine Corps to reevaluate the adequacy of RTA capabilities. These initiatives include, but are not limited to inclusion of airspace over the newly acquired lands in the Johnson Valley and TBR, Guam/CNMI range establishment, the further development of installation-level combined arms live-fire and maneuver space, and the reduction of operational constraints on amphibious landing beaches. The operating forces and operational requirements necessitate that the supporting establishment reduce risk and increase range capability to meet today's threats and tomorrow's challenges.



MARINE CORPS AVIATION MILITARY CONSTRUCTION PLAN

Effective aviation facilities portfolio management is essential to achieve the Commandant's vision for Marine Corps Aviation. This portfolio includes operation, sustainment, and repair of existing facilities, Military Construction (Milcon) for major new facilities construction, and Host-Nation Funded Construction by our allied partners. It also includes disposition and demolition of excess and end-of-life facilities.

Integrated Logistics Support includes facilities as a core element. Therefore, HQMC Aviation Logistics Support Branch provides advocacy and engagement as projects advance through the appropriate prioritization and funding processes. This enables timely completion, within budget and other constraints. Milcon is a strategic appropriation, requiring per-project congressional approval, and 5 to 7 years from initial requirement identification to construction completion. The resultant facilities will support Marine aviation for a likely 50+ year lifespan.

Success is critically dependent on team execution and unified effort by highly motivated and extremely talented professionals across the United States Marine Corps, Naval Facilities Engineering Command, United States Army Corps of Engineers, Host-Nation partners, and Industry among others.

Capable and right-sized facilities are a readiness and power-projection enabler, fulfilling an essential role within the National Defense Strategy. Our focus includes new platform introduction, integration of advanced warfighting capabilities across the MAGTF, and facilities as a manpower reducer/readiness enabler. Priority initiatives include but are not limited to:

- Construction enabling F-35B/C, CH-53K, and UAS fielding
- HMX-1 and VMX-1 new facility construction and repairs
- Level III aircraft and equipment preservation facilities
- Site preparation projects for precision landing aids

A philosophical change is occurring from purpose-built facilities, to those which focus on flexibility and commonality. This will enable agility in future unit laydown, deployments, and re-designations to serve evolutionary time-phased MAGTF requirements. This modular approach to garrison air system support will reduce dependence on specific home-basing locations, reduce construction and sustainment cost, improve resiliency, and expand Marine aviation's power projection capability.



MARINE CORPS AVIATION MILITARY CONSTRUCTION PLAN – MCI EAST

MCAS Beaufort	
FY17	P464 AIRCRAFT HANGAR - VMFAT
FY18	BE1607M REPAIR RUNWAY 05/23 (*)
FY18	BE171809M REPAIR AIRFIELD DRAINAGE FOR BASH (*)
FY18	BE1811M REPAIR HANGAR 594 AFFF SYSTEM (*)
FY19	BE1608M REPAIR AIRFIELD APRONS (*)
FY19	BE1622R IMPROVE RANGE FACILITIES FOR RFDS (*)
FY19	BE2004M REPAIR AIRFIELD STORM WATER DRAINAGE (*)
FY19	P457 CRYOGENICS FACILITY
FY19	P487 RECYCLE/HAZARDOUS WASTE FACILITY
FY20	BE1404M REPAIR HANGAR 729 (*)
FY20	BE20250M REPAIR HVAC FOR ALIS SERVER AT HANGAR 2146 (*)
FY20	BE2052M REPAIR AIRFIELD TAXIWAYS (*)
FY20	BE2053M REPAIR CONCRETE PORTIONS OF RUNWAY 14/32 (*)
FY21	P475 AIRCRAFT HANGAR - VMFAT
FY22	492 ILS PAD (*)
FY22	P458 LAUREL BAY FIRE STATION
FY22	P494 ENTRY CONTROL POINT HARDENING
FY23	P477 JET FUEL SYSTEM CAPACITY EXPANSION
FY23	P480 UPGRADE COMMUNICATION INFRASTRUCTURE
FY23	P485 F-35 OPERATIONAL SUPPORT FACILITY
FY23	P486 REPLACE OSCAR BARRACKS
FY23	P493 SHORT TAKE OFF LANES AND OVERRUNS
FY24	P462 F-35B ASSAULT STRIP
FY24	P476 CONSOLIDATED COMMUNICATIONS COMPLEX
FY24	P495 PROVOST MARTIAL BUILDING
FY25	P471 MAG-31 HEADQUARTERS
FY25	P488 WAREHOUSE
FY26	P478 STATION MAINTENANCE COMPLEX
FY26	P489 WAREHOUSE
FY27	P440 AIR EMBARK FACILITY
FY27	P461 MARINE AND FAMILY READINESS CENTER
FY27	P490 ORDNANCE CONTROL BUNKERS
FY27	P496 CLIMATE CONTROLLED WAREHOUSE

MCAS Cherry Point	
FY16	P222 AIRFIELD SECURITY UPGRADES
FY18	CP1715M/R BLDG 87 PWD CONSOLIDATION (*)
FY18	CP1820R WISC INTERIM FACILITIES (*)
FY19	CP1507M/R B4279 REPAIRS MEDIA CONSOLIDATION (*)
FY19	CP1807M/R MWSS-271 MT RELO AND BLDG REPAIRS (*)
FY19	P199 AIRCRAFT MAINT HANGAR (2 MODULES)
FY19	P235 FLIGHTLINE UTILITY MODERNIZATION, PH 1
FY20	P204 TRAINING AND SIMULATOR FACILITY
FY20	P206 RUNWAY IMPROVEMENTS (*)
FY20	P228 ATC TOWER & AIRFIELD OPS
FY21	243 AIRFIELD IMPROVEMENTS FOR ILS (*)
FY21	P197 F-35 HANGAR (2 MODULES)
FY22	237 MWSG HEADQUARTERS FACILITY (*)
FY22	P202 SUPPORT EQUIPMENT STORAGE
FY22	P205 VERTICAL LANDING PAD IMPROVEMENTS
FY22	P226 MALS 14 MAINTENANCE FAC / MAG14 HQs
FY22	P238 DLA FUELS LAB
FY22	P239 FLIGHTLINE UTILITIES MODERNIZATION, PH II
FY22	P242 WING INTEL SUPPORT COMPANY FAC
FY22	P658 INDOOR FITNESS FACILITY
FY23	196 RIFLE RANGE OPERATIONS FACILITY (*)
FY23	P#TBD KC-130J WEAPONS SYSTEM TRAINER #2 (*)
FY23	P134 PHYSICAL SECURITY - SLOCUM ROAD
FY23	P207 GROUND SUPPORT EQUIPMENT SHOP
FY23	P227 CONSTRUCT TARGET BERMS AT BT-11
FY23	P80 ATLANTIC FIELD SECURITY
FY24	232 CALA BERM (*)
FY24	P129 MACS-2 OPERATIONS & MAINTENANCE
FY24	P142 FIRE STATIONS
FY24	P200 F-35 HANGAR (2 MODULES)
FY24	P210 MCALF BOGUE AIRFIELD IMPROVEMENTS
FY26	P143 PHYSICAL SECURITY UPGRADES - MAINGATE
FY26	P162 SECURITY OFFICE
FY26	P173 MWCS DETACHMENT FACILITY
FY26	P244 CRASH FIRE RESCUE FACILITY
FY27	P201 F-35 HANGAR (1 MODULE) RESERVE

MCAS New River	
FY19	P680 CARGO LOADING TRAINER
FY20	P378 3-MODULE TYPE-II HANGAR (HMH)
FY20	P695 CTR FOR NAVAL AVIATION TECH TRAIN (CNATT)
FY20	P707 BEQ
FY20	P728 C-12 A/C MAINT HANGAR
FY23	P380 3-MODULE TYPE-II HANGAR (VMM)
FY23	P389 GROUP HEAD QUARTERS MAG-29
FY23	P690 STATION ARMORY
FY23	P706 SQUADRON WAREHOUSE
FY23	P709 ORDNANCE MAGAZINE
FY24	P#TBD AIRFIELD IMPROVEMENTS FOR ILS (*)
FY24	P559 RUNWAY EXTENSION 01/19
FY24	P712 DOUGLASS GATE SECURITY UPGRADES
FY26	P666 2-MODULE TYPE-II HANGAR (HMLA)
FY29	P721 MALS REPLACEMENT HANGAR

MCI NATIONAL CAPITOL REGION

MCAF Quantico	
FY20	TBD AIRFIELD IMPROVEMENTS FOR ILS (*)

Notes

- (*) indicates projects which may potentially be funded by Unspecified Minor Construction or Operations and Maintenance appropriations. Exact appropriation varies by project.
- Dates reflect project program year, typically year of construction start. Milcon planning timelines are typically 2 years accelerated compared to non-Milcon appropriations.
- The projects listed are required to achieve the current AvPlan or to correct other deficiencies. The information represents a snapshot in time, and is subject to change.
- Construction completion schedules vary based on project type, but are typically 2 to 3 years after project program date.

MARINE CORPS AVIATION MILITARY CONSTRUCTION PLAN – MCI WEST

MCAS Yuma	
FY20 P596 HANGAR 95 RENOVATION (VMX -- F-35)	
FY21 P364 FITNESS/WATER SURVIVAL TRAIN FAC	
FY21 P532 SECURE ACCESS CONTROL FACILITY	
FY21 P538 BEQ	
FY21 P591 WATER TREATMENT FACILITY	
FY23 P446 CONSOLIDATED ORDNANCE DISPOSAL	
FY23 P493 RUNWAY 3R/21L EXTENSION	
FY23 P503 TRANSIENT QUARTERS	
FY23 P504 CONSOLIDATED STATION ARMORY	
FY23 P531 TAC AIR COMMAND CENTER	
FY23 P536 MAG/MALS/STATION OPS FACILITY (F-35)	
FY23 P576 ALF PH II (F-35)	
FY23 P579 AVIATION MAINTENANCE STORAGE FAC	
FY23 P585 RUNWAY UPGRADES (F-35)	
FY23 P606 VMU-1 HANGAR & LOG COMPLEX	
FY23 P620 MAINT ADDITION TO H78	
FY23 P621 MAINT ADDITION TO H80	
FY23 P622 BEQ (F-35)	
FY23 P623 MOUT COLLECTIVE TRAINING FACILITY	
FY24 P421 STUDENT QUARTERS BOQ	
FY24 P501 FIRE STATION	
FY24 P570 AIRCRAFT MAINT HANGAR (F-35)	
FY24 P572 COMPOSITE REPAIR FACILITY (F-35)	
FY24 P587 TAXIWAY UPGRADES	
FY24 P589 VL PAD	
FY24 P600 MAINT BUILT IN TEST PADS (F-35)	
FY25 P551 AIRCRAFT MAINT HANGAR (F-35)	
FY26 P542 MWSS-371 RELOCATION	
FY27 P419 LIFELONG LEARNING CENTER	
FY27 P450 RELIGIOUS EDUCATION CENTER ADD	
FY27 P640 AIRFIELD DUST ABATEMENT	
FY28 P580 FLIGHT LINE PARKING STRUCTURE (F-35)	
FY28 P616 LOX/N2 FACILITY	
FY29 P598 CONSOLIDATED CHILLER FACILITY	

MCAS Miramar	
FY17 P198 F-35 AIRCRAFT MAINTENANCE HANGAR A	
FY17 P203 F-35 AIRCRAFT PARKING APRON	
FY17 P249 F-35 COMM BUILDING AND INFRASTRUCTURE UPGRADE	
FY18 1828 SITE PREP FOR FA-18 PRESERVATION SHELTER (*)	
FY18 2020 REPAIR INSTRUMENT LANDING SYSTEM (*)	
FY18 242 DEHUMIDIFICATION SYSTEM AVIATION ARMAMENT (*)	
FY18 P210 F-35 SIMULATOR FACILITY	
FY19 P222 F-35 VERTICAL LANDING PADS AND TAXIWAY	
FY19 P238 AIRFIELD SECURITY IMPROVEMENTS	
FY21 P225 AIRFIELD TAXIWAY	
FY22 P254 F-35 CENTRALIZED ENGINE REPAIR FACILITY (CERF)	
FY23 P201 F-35 AIRCRAFT MAINTENANCE HANGAR B	
FY23 P258 HANGAR 3 MODIFICATION AND ADDITION	
FY23 P268 CH53K SIMULATOR FACILITY	
FY23 P270 WING HEADQUARTERS	
FY23 P271 MAG-11 HEADQUARTERS	
FY23 P272 MAG-16 HEADQUARTERS	
FY23 P273 MACG-38 HEADQUARTERS	
FY23 P274 MWSG-37 HEADQUARTERS	
FY24 P193 BACHELORS ENLISTED QUARTERS	
FY24 P197 INDOOR FITNESS FACILITY	
FY24 P204 VEHICULAR BRIDGE	
FY24 P216 RUNWAY 24R PHASE 1	
FY24 P247 INERT STOREHOUSE	
FY25 P#TBD AVIATION LEVEL 3 PRESERVATION FACILITY	
FY25 P202 F-35 AIRCRAFT MAINTENANCE HANGAR C	
FY25 P234 RUNWAY 24R PHASE 2	
FY26 P220 FIRST RESPONSE STATION	

MCAS/MCB Camp Pendleton	
FY19 PA1803M REPAIR LEVEE (*)	
FY19 PA1801M/1902M REPAIR AIRCRAFT APRON / PAVEMENT (*)	
FY20 PA2002M REPAIR RUNWAY (*)	
FY20 PA2001MR REPAIR, RECONFIGURE, CONSTRUCT SIM B2394 (*)	
FY21 P#TBD HOLF RUNWAY LIGHTING IMPROVEMENTS	
FY21 P#TBD LHD PAD MODERNIZATION	
FY21 P#TBD VTOL PAD MODERNIZATION	
FY22 P135 AVIATION PRESERVATION WAREHOUSE	
FY22 P137 AVN CORROSION CONTROL FAC	
FY22 P139 AIRCRAFT RESCUE AND FIRE FIGHTING STATION	
FY22 P140 ARM AND DEARM TAXIWAY	
FY23 P#TBD AIRFIELD IMPROVEMENTS FOR ILS (*)	
FY23 P120 MAINT HANGAR EXPANSION	
FY25 P141 AIRCRAFT MAINTENANCE HANGAR 4&5	
FY26 P138 MARINE AVIATION VMU-4 FACILITIES	

MCAF Kaneohe Bay	
FY18 P877 MOKAPU GATE ENTRY CONTROL AT/FP COMPLIANCE	
FY18 P887 LHD PAD CONVERSION AND MV-22 LANDING ZONES	
FY19 P946 CORROSION CONTROL HANGAR	
FY20 P911 BACHELOR'S ENLISTED QUARTERS (AVIATION SUPPORT)	
FY22 P836 MAG-24 HQ AND PARKING BUILDING	
FY22 P875 WATER RECLAMATION FACILITY REGULATORY UPGRADES	
FY22 P876 AIRFIELD SECURITY FENCING & UPGRADE	
FY22 P912 BACHELOR ENLISTED QUARTERS	
FY22 P913 MAG-24 ARMORY EXPANSION	
FY22 P935 ELECTRICAL DISTRIBUTION MODERNIZATION	
FY22 P956 BACHELOR ENLISTED QUARTERS	
FY23 P931 PUULOA RANGE COMM/ELEC & GATE MODERN	
FY23 P948 MALS-24 MAINTENANCE FACILITY	
FY23 P951 MAIN GATE ENTRY CONTROL AT/FP COMPLIANCE	
FY24 P#TBD AIRFIELD IMPROVEMENTS FOR ILS (*)	
FY24 P879 ORDNANCE STORAGE MAGAZINE	
FY24 P891 HANGAR 102 UPGRADES CH-53K	
FY24 P930 FIRE STATION	
FY24 P954 CH-53K GROUND OPERATIONS AIR CREW TRAINER	
FY25 P774 PTA EQUIPMENT STORAGE	
FY25 P916 RENOVATION OF B301 FOR MALS-24 HQ	
FY25 P926 MALS ORDNANCE STORAGE	
FY26 P882 RUNWAY CLEAR ZONE AND AIRFIELD IMPROVEMENTS	
FY27 P798 HANGAR 103 AND 104 FIRE PROTECTION	
FY27 P928 PTA AMMUNITION STORAGE	
FY28 P883 RUNWAY UNDERPASS	

MCAS Futenma	
FY20 202 GATE 1 UPGRADE (*)	
FY20 205 AIRCRAFT RUNWAY OVERRUN (*)	
FY20 214 JP-5 FUEL TRUCK OFF-LOAD SYSTEM (DLA) (*)	
FY21 P#TBD H-1 SIMULATOR SITE PREP (*)	
FY21 P#TBD MALS-36 ORDNANCE OPERATIONAL SUPPORT (*)	

MCAS Iwakuni	
FY18 P1006 KC130J ENLISTED AIR CREW TRAINER FACILITY	
FY20 P1000 ACFT MAINT HANGAR IMPROVEMENTS, SOUTH	
FY20 P1005 VTOL PAD – SOUTH	
FY22 P#TBD MAG-12 AME OPERATIONAL SUPPORT FACILITY (*)	
FY22 P1001 AIRCRAFT MAINT HANGAR IMPROVEMENTS	

MCI PACIFIC

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- Construction completion schedules vary based on project type, but are typically 2 to 3 years after project program date.

The image shows two silhouetted figures standing on the deck of a military aircraft, looking out through the open bay door. In the distance, another aircraft is visible in flight against a cloudy sky. The scene is dimly lit, emphasizing the silhouettes and the bright light from the sky.

Section 5 Marine Aviation - Unique Commands

5.1 Reserves

5.2 MAWTS-1

5.3 VMX-1

5.4 HMX-1

RESERVE AVIATION WITHIN THE TOTAL FORCE

The 4th Marine Aircraft Wing's (MAW) mission is to provide combat ready aviation forces capable of worldwide deployment to Marine Air Ground Task Forces, Fleet Marine Forces, and combatant commands. Additionally, 4th MAW serves alongside the active component MAWs, sourcing MARFORCOM and combatant commanders requirements in accordance with United States Code Title 10 (10173) and in the manner specified by the Secretary of Defense. Daily distributed operations are conducted from 19 sites in 14 states in order to **augment, reinforce, and sustain** the active component with an operational aircraft wing.

The success of the Marine Corps' Total Force construct is based on enduring and habitual relationships, standardized TTPs, and common platforms. The reserve and active components must share common aircraft, equipment and TTPs. 4th MAW provides unique force multipliers and complementary units to augment, reinforce, and sustain the active component Marine Corps.

Enduring Requirements: 4th MAW will man, train, and equip units for expeditious deployment and sustained combat operations as directed by the Commandant of the Marine Corps.

Theater Security Cooperation / SPMAGTF: 4th MAW remains postured to provide forces to meet combatant commanders' demand for forces in support of our allies and partner nations around the globe.

OPLANs/CONPLANs: 4th MAW remains postured to support OPLAN/CONPLAN exercises and contingency operations. **Unit Deployment Program:** 4th MAW supports the Unit Deployment Program by providing OPTEMPO relief for the active component as required.

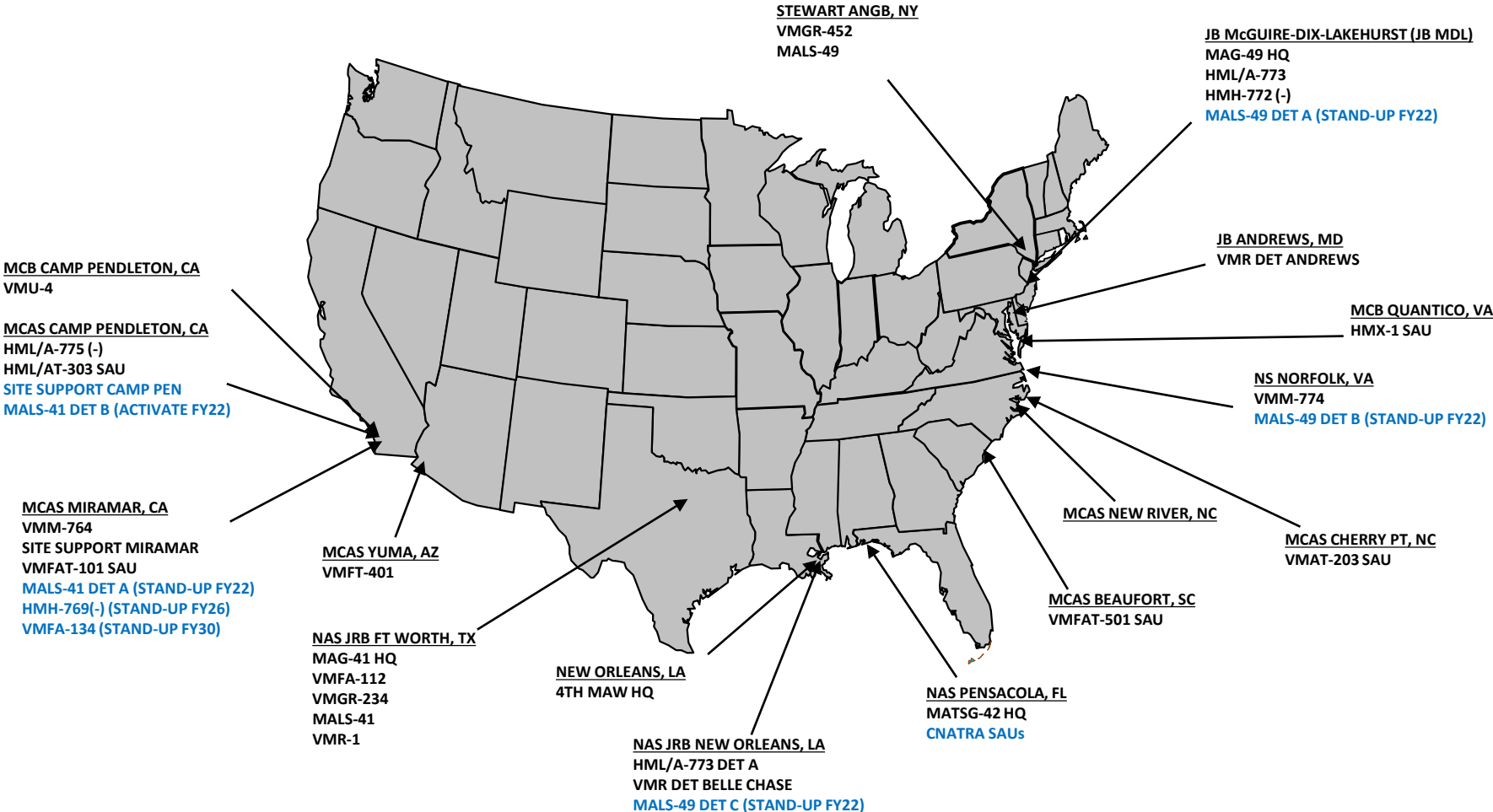
Pre-deployment Training: 4th MAW supports training for units preparing for deployment through ongoing support for the Integrated Training Exercises (ITX) aboard MCAGCC Twenty Nine Palms and MARSOC's Exercise Raven.

Marine Corps Training Support: 4th MAW has the **only dedicated aggressor capability within the Marine Corps** to support Weapons and Tactics Instructor (WTI) courses, Marine Division Tactics Courses (MDTC), and all T/M/S tactical training with priority to F-35 Air-to-Air training support.

Force Augmentation: 4th MAW provides highly-qualified individual battle staff officers to augment&reinforce JTF, MARFOR, MEF, MEB, and MEU command elements in support of exercises and contingencies. In addition, MATSG-42 Squadron Augmentation Units (SAU) support USMC Fleet Replacement Squadrons, Naval Air Training Command, and HMX-1.

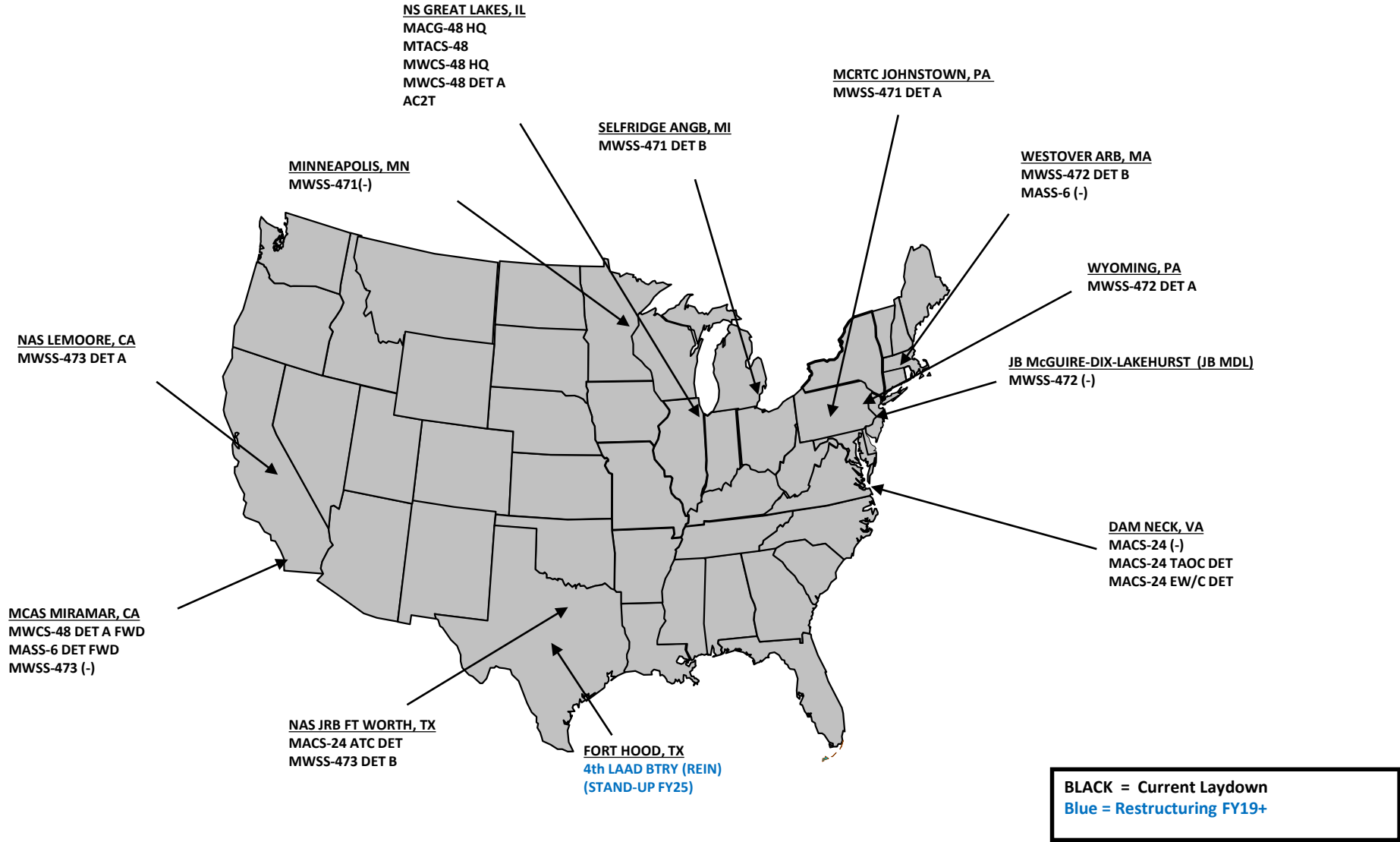
C2 and Unit Reactivation: 4th MAW is currently seeking solutions to C2 associated with unique distributions of forces, such as the activations of HML/A-775 and VMU-4 as well as the future activation of HMM-769(-) and VMFA-134. All these units are currently aligned to fall under MAG-41; however, the number of units and their geographic disbursement will exceed MAG-41's ability to effectively execute C2 and thus another course of action will be required. In addition, Reserve Force 2025 calls for the activation of 4th LAAD Battery (REIN) in Fort Hood, TX in FY25.

4TH MAW GROUP, SQUADRON, AND MALS LAYDOWN



BLACK = Current Laydown
Blue = Restructuring FY19+

4TH MAW MACG AND MWSS LAYDOWN



MARINE AVIATION WEAPONS AND TACTICS SQUADRON ONE

MAWTS-1 originated in the aftermath of World War II, when Marine pilots were first assigned to Navy Composite Squadrons (VCs). These squadrons, operating from shore bases and carriers, were assigned the special weapons delivery mission. Special Weapons Training Units (SWTUs) were formed to provide necessary training to the attack squadrons. In response to their growing mission, the size of the SWTUs was increased, and they were redesignated as Marine Air Weapons Training Units, MAWTULant at Cherry Point, North Carolina, and MAWTUPac at El Toro, California.

In 1975, a study group was formed at Headquarters Marine Corps to determine requirements for the enhancement and standardization of aviation training. A series of recommendations, labeled as numbered projects, were made to the head of Marine aviation and to the Commandant in early 1976. Project 19 recommended establishment of the Weapons and Tactics Training Program (WTTP) for all of Marine aviation.

The cornerstone of the WTTP was the **development of a graduate-level Weapons and Tactics Instructor (WTI) Course and the placement of WTI graduates in training billets in every tactical unit in Marine Corps Aviation.** Consolidated WTI Courses were subsequently conducted at Marine Corps Air Station, Yuma, Arizona, by a combined MAWTU staff in May 1977 and February 1978. Due to the overwhelming success of the consolidated WTI Courses, the Commandant of the Marine Corps **commissioned Marine Aviation Weapons and Tactics Squadron One at Marine Corps Air Station, Yuma, Arizona, on 1 June 1978.**

MAWTS-1's mission is to provide standardized graduate-level advanced tactical training for Marine aviation and assist in the development and employment of aviation weapons and tactics. Advanced tactical training is accomplished through two Weapons and Tactics Instructor (WTI) Courses and two Marine Division Leader Tactics Courses each year, as well as home station fleet support throughout the year.

MAWTS-1 provides assistance to Headquarters Marine Corps, industry, and the Systems Commands in the development and employment of aviation weapons and tactics through the Aviation Development, Tactics and Evaluation (ADT and E) department. ADT and E's enduring mission to develop weapon systems requirements, create concepts of operation, manage Marine aviation doctrine, and conduct tactical demonstrations (TACDEMOs) of advanced emerging concepts keeps Marine aviation engaged at the forefront of combat tactics.

Among these is the convergence of cyber and electronic warfare. MAWTS-1 is currently pursuing new and innovative techniques in the application of both kinetic and non-kinetic combined arms in support of MAGTF objectives.

CENTERS OF EXCELLENCE

MAWTS-1 is partnering with the Marine Corps Tactics and Operations Group (MCTOG) and the Marine Corps Logistics Operations Group (MCLOG) to create a MAGTF Weapons School environment, responsible for the development of individual advanced tactical training, as well as exercise design supporting the MAGTF Training Program. This construct creates both an individual and collective training environment supported by a **MEB-level operational scenario**, allowing our Marines to train in an OPLAN-informed environment and perform with acumen across the spectrum of conflict.

Additionally, the combined arms integration of the WTI course and Talon exercise (TALONEX) continues to provide exceptional infantry battalion live fire training as part of the MAGTF Training Program.

MARINE AVIATION WEAPONS AND TACTICS SQUADRON ONE

WEAPONS AND TACTICS INSTRUCTOR (WTI) COURSE

MAWTS-1's semi-annual training venue, the Weapons and Tactics Instructor Course, is the Marine Corps' only service-level exercise that provides students and supporting units the full spectrum of combat operations: from small unit inserts to noncombatant evacuation operations (NEOs) to infantry battalion heliborne lifts into the heart of a sophisticated enemy's battlespace; up through the highest-threat strike and air-to-air combat profiles. Exposing Marine, joint and partner nation prospective WTIs to the unique array of capabilities our MAGTF brings to the fight is the hallmark of this training program.

Aside from a rigorous academic curriculum, students participate in numerous graduate level exercises that integrate all six functions of Marine aviation. These evolutions, such as anti-air warfare, air base ground defense, assault support tactics, offensive air support, and ground based air defense culminate in a series of final exercises that integrate joint, conventional and special operations forces.

WTI continues to serve as the best live and simulated training venue for the Marine Air Control Group and the largest training exercise which employs a MACCS and all aviation assets via an Air Tasking Order. The MACG deploys with more than 900 personnel and over 90 million dollars' worth of equipment.



MARINE AVIATION WEAPONS AND TACTICS SQUADRON ONE

CONCEPT EXPERIMENTATION

As the Marine Corps pursues new concepts, MAWTS-1 continues to define and standardize the training the ACE requires to support future MAGTF operations. Marine aviation is central to dispersed and effective maneuver elements and enables such rapid response now. With aviation weapons systems like the KC-130J, F-35B, MV-22, and RQ-21, the MAGTF will be equipped to quickly respond to crisis across the range of military operations.

MAWTS-1 facilitates **experimentation and collaboration** across multiple venues with different agencies. The movement of VMX-1 to MCAS Yuma has presented a tremendous opportunity for synergistic planning and execution of TACDEMOS for Marine aviation innovation and experimentation advancement. MAWTS-1 is also working with PEO Land Systems to develop and advance counter-small UAS TTPs. **The coordination of VMX-1 and MAWTS-1** will ultimately improve operational test, link OT with MAWTS-1 IP aviation subject matter expertise, and improve TTP development and innovation efforts across the Marine Corps.

MAWTS-1 is embracing and shaping future operations with respect to handheld tablet devices. Whether working with MARCORSYSCOM on the Target Handoff System (V)2, the PMA-281 Electronic Kneeboard (EKB), the Marine Corps' Next Generation Handheld solutions, or the Marine Air Ground Tablets (MAGTABs), MAWTS-1 is involved in expanding the discussions, shaping the requirements, evaluating the products, stressing the networks, and developing TTPs for use in both training and operational environments.

Leading the charge with digital interoperability development, MAWTS-1 continues to advance DI by continuing to work with HQMC to design and develop the Concept of Employment and develop TTPs. During varied mission sets within the WTI course, MAWTS-1 continues to expand exposure to varied platforms and aviation command and

control elements to further interoperability across the MAGTF. Students are being exposed to the MAGTAB suite and Mission Management Systems for planning and executing missions.

The UH-1Y, AH-1Z, MV-22, CH-53E, and KC-130J communities further explore our range of capabilities within this arena while conducting multiple varied missions between Yuma, 29 Palms, and Camp Pendleton. The ADT and E department takes advantage of these evolutions to demonstrate multiple airborne and ground networks connected with commercial level encryption with gateways that interconnect waveforms such as Link 16, TTNT, Net-T, CDL, and ANW2 through use of MAGTF Agile Network Gateway Links (MANGL) installed on the MV-22 and CH-53. This connectivity provides troop commanders enhanced situational awareness via Wi-Fi networked tablets, expanded C3, limited gateway functionality and mesh network range extension to the MACCS.

We have begun to train the TALONEX infantry battalions on the use of wirelessly networked MAGTABs using the ANW2 waveforms available in the infantry units via PRC-117G radios. This expands our TTP development by not just focusing on the aviation assets, but the supported units embarked and disembarked on our missions.

MAWTS-1 continues to explore new and innovative ways of improving our lethality by experimenting with Integrated Fire Control (IFC) and non-conventional weapons targeting and sensor support. A few examples have been experimentation with HIMARS, Patriot, CAC2S, G/ATOR and joint fighter aircraft. We have continued to evaluate F-35 DSO, and ordnance such as TALD and APKWS.

MARINE AVIATION WEAPONS AND TACTICS SQUADRON ONE

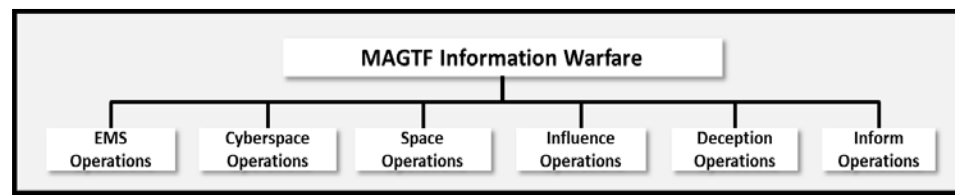
C3

MAWTS-1 continues to spearhead innovating concepts to increase our lethality via the command, control, and communications (C3) department. With the employment of the Advanced Simulation Combat Operations Trainer (ASCOT), MAWTS-1 increases the scope and depth of knowledge of our command and control Marines in the live / virtual / constructive (LVC) environment.

Additionally, during previous WTI courses, a composite detachment of DASC and TAOC Marines combined to perform a proof-of-concept for future MACCS agency employment. In 2018, we will continue to experiment with aviation command and control nodes capable of supporting both air support and air defense from a common set of equipment. MAWTS-1 C3 and VMX-1 are partnering to collect data and lessons learned in support of HQMC Aviation's future MACCS roadmap.

MAWTS-1's C3 Department is deeply involved in implementing CAC2S as a ground-based gateway, fusing real-, near-real, and non-real-time data derived from the F-35, RQ-21, G/ATOR, intelligence sources and other inputs into an integrated tactical picture providing the ground combat element new levels of situational awareness and advanced decision support tools.

The new systems of the Marine air command and control system allow the MAGTF commander to "see" and exploit opportunities with speed and precision.



MAGTF INFORMATION WARFARE

MAWTS-1 has established a Spectrum Warfare Department (SWD) in order to provide the WTI Course with instruction on MAGTF Information Warfare (IW). The full scope of MAGTF IW can be grouped into six basic categories or mission areas: electromagnetic spectrum operations, cyberspace operations, space operations, influence operations, deception operations, and information operations. The SWD has created a representative information environment that enables MAGTF IW operations during the WTI course.

The SWD has developed and initiated an academics program that provide the prospective WTIs with instruction on the MAGTF IW mission areas and prepares them for the planning and flight-side execution phases of the course. MAGTF IW tasks and effects are developed within the SWD, as the MAGTF CE, and provided to the pWTIs as effects that will support their flight evolutions and/or tasks that the ACE will execute in support of the MAGTF IW Concept of Operations.

Progressing into 2018, the SWD is focused on the maturation of a Contested Degraded Operationally Limited (CDO) environment. This will provide the pWTIs with exposure to and flight side training in an expanded communications jamming and monitoring as well as GPS, SATCOM, and TADL denied environment.

The SWD will continue to take and seek initiatives that will prepare ACE pWTIs to overcome the challenge identified in the *Marine Operating Concept*: "The Marine Corps is currently not organized, trained, and equipped to meet the demands of a future operating environment characterized by complex terrain, technology proliferation, information warfare, the need to shield and exploit signatures, and an increasingly non-permissive maritime domain."

MARINE AVIATION WEAPONS AND TACTICS SQUADRON ONE

DISTRIBUTED OPERATIONS

The assault support and aviation ground support departments continue to **refine the procedures for the conduct of distributed operations missions with STOVL aircraft at Laguna Army Airfield.** MV-22B aircraft conduct ADGR and weapons reload for the F-35B, increasing the number of sorties sent to the objective area executing offensive air support. This falls in line with the F-35B's desired capability to fight in anti-access/area denial (A2/AD) environments. This work informs the Marine Corps' movement toward EABO.

With the F-35B, our MEUs and MEBs will have a fifth-generation low observable strike and sensor platform providing a unique and critical role in joint forcible entry operations. Distributed operations are also well-rehearsed during separate evolutions involving forward arming and refueling points (FARPs) by MV-22s, CH-53E, and KC-130J aircraft supporting AH-1 and UH-1 aircraft sorties. These rapidly deployable FARPS relocate on call based on the enemy situation and mission requirements providing fuel and ordnance to Marine attack and utility helicopters.

ADVANCED AIRCRAFT MAINTENANCE OFFICER COURSE (AAMOC)

AAMOC is intended to be a **graduate school for aircraft maintenance officers in the Marine Corps.** The mission of AAMOC is to empower the students with leadership tools, greater technical knowledge, and standardized practices through rigorous academics and hands on training.

The curriculum consists of an initial and final exam, and roughly 60 hours of course work during the first eight days. During this portion of the course students are given classroom instruction on topics ranging from operations / maintenance coordination to expeditionary maintenance. Students hone the skills learned during the academic period as Maintenance Material Control Officers and gain experience

during the conduct of WTI. They are graded on retention of the prescribed material and the application of standardized procedures throughout the course.

Students concurrently work on small group capstone projects which are presented at the end of the course. These assignments are an in-depth study of a student chosen topic that can be supported by empirical data. Successful projects are intended to become incorporated as a "best practice" and taught to future students. Senior aviation logistics leaders from the MAWs are invited to attend the presentations and serve as guest evaluators.



MARINE AVIATION WEAPONS AND TACTICS SQUADRON ONE

TACTICAL RISK MANAGEMENT

Tactical Risk Management (TRM) is a key tenet of the Weapons and Tactics Instructor Course and how we manage the risk associated with USMC aviation operations. In the MAWTS-1 TRM course we teach our students to respect and mitigate the “blue” threat. We also teach the adage “a **plan that is tactically sound is inherently safe.**” The fact remains, however, that the blue threat is more lethal than ever, responsible for over 90% of our Class A mishaps. The WTI is critical to managing an effective tactical training program while balancing today’s challenges of readiness and proficiency, operational tempo, and manpower shortfalls. Providing our WTI graduates with a mastery of TRM is the key to meeting this challenge.

As a holistic critical thinker, the WTI is expected to consider the myriad factors that are associated with or contribute to blue threats. The WTI course builds on the fundamentals of ORM by presenting the students with various safety topics through the lens of mission effectiveness. Some of the principles taught during TRM are risk management, ethics, leadership, human performance, aerodynamics, managing red and blue threats, and professionalism in their trade. The MAWTS-1 TRM package seeks to foster a **WTI culture of critical thinkers who are focused on mission accomplishment while maintaining a balanced approach to risk management fundamentals and threat analysis.**

The TRM syllabus provides approximately 17 hours of instruction including small group discussions based on personal experiences and mishap reviews. Experienced guest speakers provide presentations that touch on all of the key facets of TRM with emphasis placed on thinking critically about the subject matter. TRM principles are reinforced throughout the execution phase. MAWTS-1 requires students to develop a mitigation strategy and brief the red and blue threat (risk to mission/risk to force) during every confirmation brief. During mission

planning, the WTI students are asked if their plan is tactically sound and executable with the assets that have been allocated to the mission. If not, they amend their plan until both the red and blue threats are mitigated. Risk management is inherent to the mission planning conducted during WTI.

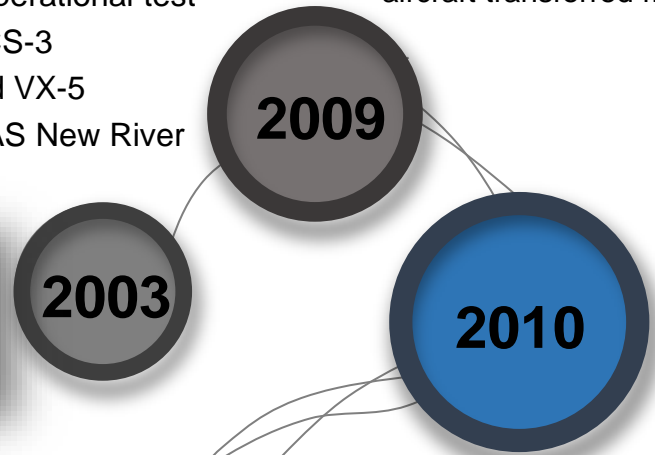
Rather than presenting TRM topics over three consecutive days, WTI 1-18 students will experience TRM spread throughout the course. Historically, the entire syllabus has been presented during the first week of academics. With this change, TRM will start on day one and be woven throughout the course, with the final day of presentations taking place the day before flight phase. This effort aims to ensure TRM is continuously messaged and at the forefront of everyone’s mind prior to executing flight operations.

Marine Corps aircraft and aircrew are national assets and their preservation is essential to continued success on the battlefields of tomorrow. TRM is our bid for success to reshape the thinking of future tactical leaders to fully consider the blue threat while maintaining lethality and survivability on the contested battlefields where the MAGTF fights. Ultimately, the goal of TRM is to produce WTI graduates who return to the fleet with a graduate-level ability to lead unit training while properly assessing and managing risk to achieve mission success with zero preventable mishaps.

MARINE OPERATIONAL TEST AND EVALUATION SQUADRON ONE

1946: General Geiger, Hogaboom Board
 1947: HMX-1 stood up to demo helicopter capabilities
 1951: VX-5 stood up; fixed wing operational test
 1970: MCTSSA created from MACS-3
 1993: VX-9 created from VX-4 and VX-5
 2003: VMX-22 established at MCAS New River

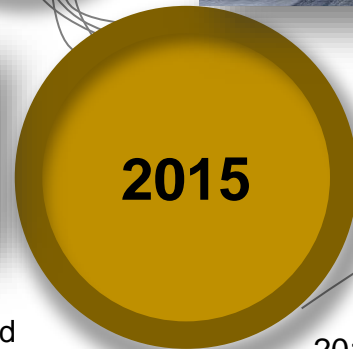
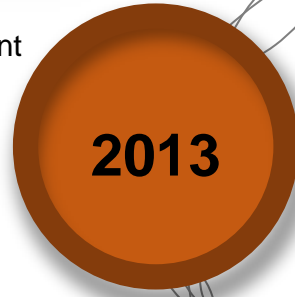
2009: Assumed CH-53E OT&E mission from HMX-1; CH-53E test aircraft transferred from HX-21 in 2014



2010: F-35 Det Established at Edwards AFB



2013: Command, Control, & Communications (C3) Department and Unmanned Aerial Systems (UAS) Division Established



2015: HQ and MV-22 Test Team transferred from MCAS New River to MCAS Yuma; AH and UH-1 OT&E Transferred from VX-9

2016: Re-designated as VMX-1; S&T Department Established



MARINE OPERATIONAL TEST AND EVALUATION SQUADRON ONE

Conduct operational test and evaluation of U.S. Marine Corps aviation platforms and systems under the authority of Commander, Operational Test and Evaluation Force (COMOPTEVFOR) or Director, Marine Corps Operational Test and Evaluation Activity (MCOTEA). **Create, document, and disseminate initial tactics, techniques, and procedures** for Marine aviation platforms and systems. Support further **concept development and refinement** of Marine aviation tactics, techniques, and procedures. Coordinate and conduct **government-sponsored experimentation and tactical demonstrations**. Provide additional **operational support** as directed by Deputy Commandant for Aviation.



F-35B Det: Edwards AFB



VMX-1 HQ: MCAS Yuma



CH-53E/K Det:
MCAS New River



MARINE OPERATIONAL TEST AND EVALUATION SQUADRON ONE

OVERVIEW

VMX-1 is Marine aviation's primary operational testing unit and leads the way into our future Marine Corps by conducting formal operational testing in support of our program offices, educating the fleet on new equipment and TTPs, and coordinating innovation efforts. These efforts align with the Service and Department of Defense Science and Technology (S&T) objectives in concert with federally funded research laboratories, service laboratories, and other DoD innovation centers. The broad spectrum of the VMX-1 mission will continue to expand and enhance the Marine Corps' autonomy in ensuring that Marine aviation is equipped to meet the needs for today's fight while building towards meeting the needs of the future.

F-35B TEST TEAM

VMX-1 Det Edwards continues testing on six F-35B Lightning II aircraft. As part of the Joint Strike Fighter Operational Test Team (JOTT) at Edwards AFB, the detachment has received all aircraft and has begun executing test requirements for IOT&E of the F-35B. The detachment will maintain six aircraft through the IOT&E process. The detachment also supports initial tactics development as new software and weapon systems capabilities are introduced. Recent testing includes data link integration, integrated fire control, and shipboard operations in an effort to optimize the F-35 for the warfighter.

Following the completion of IOT&E, the F-35Bs will transition from Edwards AFB to MCAS Yuma to join the VMX-1 aviation combat element (ACE). Development and refinement of amphibious and expeditionary operations will continue by integrating the F-35B and the rest of the VMX-1 ACE.

SCIENCE AND TECHNOLOGY

The VMX-1 S&T Department supports the efforts of federally funded labs and government partners with operationally relevant vignettes in order to inform future requirements and develop capabilities that reflect the needs of fleet Marines. By working closely with each of the T/M/S oriented Departments, the S&T Department helps pair burgeoning technology with previously documented capability gaps within established programs of record. Additionally, the S&T Department has cultivated a strong tie to the "innovation space" through traditional and non-traditional partners alike. To support more traditional pathways of service sponsored experimentation, VMX-1 S&T works with the Defense Advanced Research Project Agency (DARPA) and Marine Corps Warfighting Lab (MCWL) on aviation related equities, has enabled operationally relevant venues for experimentation with the Strategic Capabilities Office (SCO) and developed minimum viable products (MVPs) hand in hand with the Office of Naval Research (ONR). In support of the less traditional pathways, VMX-1 provides subject matter expertise to organizations like Defense Innovation Unit (formerly DIUx) in Silicon Valley and the Hacking for Defense (H4D) program located at multiple graduate education campuses nationwide.

To execute government sponsored experimentation, VMX-1 synchronizes aviation's efforts with the semiannual Weapons and Tactics Instructor (WTI) Courses in collaboration with MAWTS-1 and sponsors additional standalone events to create opportunities for iterative learning. The proximity to and strong professional ties with MAWTS-1 provide a unique environment for Marine aviation to incubate the next generation of tactical and operational excellence.

Moving forward, VMX-1 the S&T Department is poised to continue supporting all facets of Marine aviation - from TTPs for Artificial Intelligence (AI) applications in C4ISR and aviation maintenance to Manned-Unmanned Teaming (MUMT).

MARINE OPERATIONAL TEST AND EVALUATION SQUADRON ONE

MARINE AIR COMMAND AND CONTROL SYSTEMS

The VMX-1 C3 Department is charged with ensuring future aviation C2 systems are operationally suitable and interoperable, and that those systems meet warfighter requirements across the spectrum of military operations. To accomplish this, the C3 Department contributes to OT&E of aviation C2 systems through support to MCOTEA and conducts concept and TTP development through integration with MAWTS-1 C3 Department and in coordination with the supporting establishment and operating forces. The C3 Department's primary areas of focus in 2018 were on providing support to MCOTEA's test of the AN/TPS-80 Ground/Air Task Oriented Radar (G/ATOR) and in assisting the Ground Based Air Defense program office on the development and evaluation of Light Marine Air Defense Integrated System (L-MADIS).

The C3 Department also coordinated the first live fire of the Compact Laser Weapons System on a Marine Corps range which will result in significant cost savings over firing on test ranges. In FY19, C3's test and evaluation efforts will support refinement of L-MADIS as well as future testing of the entire MADIS family of systems, refinement of the Tactical Air Control Element (TACE) concept, administrative support to MCOTEA's AN/TPS-80 G/ATOR test report, and aviation C2 subject matter expert support to aircraft testing. In addition to tests, C3 will support Counter-UAS projects and TTP development, airspace integration plans to incorporate friendly small UAS, Integrated Fire Control (IFC) events, MAGTF Digital Interoperability, experimentation with online collaborative environments for the MACCS community, and participate in communities of interest with other entities pertaining to such topics as Artificial Intelligence and Live/Virtual/Constructive (LVC) training.

CH-53

VMX-1's CH-53E/K Detachment is stationed at MCAS New River with three CH-53Es and one CH-53K. The Detachment supports various operational and developmental test efforts. Developmental testing of the #2 Engine Backflow Duct Installation and Instrumentation in NAS Patuxent River, MD and MCAS New River, NC was conducted during FY18. The Detachment will also be prepared to assist in the SpaceX Dragon Drop which will test the spacecraft's reentry capabilities in FY19. The CH-53 Division continues to support the validation and certification of various external and internal cargo loads at Aberdeen Proving Ground, MD. VMX-1 is supporting, and will continue to support, the development of the CH-53K by participating in integrated testing at NAS Patuxent River, MD. The New River Detachment has and continues to support the Logistics Demonstration (LOGDEMO) for the CH-53K. Once the CH-53K operational testing is complete, the VMX-1 CH-53E/K Detachment will join the VMX-1 main body at MCAS Yuma with two CH-53E and two CH-53K aircraft.

H-1

Three AH-1Zs and three UH-1Ys reside at VMX-1 headquarters as operational test aircraft. In 2018, VMX-1 conducted testing of the M282 Penetrator Warhead mounted on the Advanced Precision Kill Weapon System (APKWS), the Joint Air-to-Ground Missile (JAGM), Digital Interoperability - Full Motion Video. The H-1 division also provided support for F-35 testing, as well as verifications of deficiencies testing for the Joint Service Aircrew Mask. Future tests will include APR-39D(V)2 Radar Signals Detecting Set, H-1 software upgrades with JAGM, Digital Interoperability - Full Motion Video Spiral 1.2 Upgrade, and a Quick Reaction Assessment of the Distributed Aperture Infrared Countermeasure (DAIRCM) system in support of Rapid Deployment Capability.

MARINE HELICOPTER SQUADRON ONE

HMX-1's missions include worldwide transportation for the President of the United States, transportation within the National Capital Region for the Vice President of the United States, members of the President's cabinet, and visiting heads of state. HMX-1 provides support for the Commanding General, Marine Corps Combat Development Command, and continues to conduct operational test and evaluation for rotary wing presidential lift aircraft.

HMX-1 is currently entering the execution phase of their Presidential Helicopters Replacement Program.

The VH-92A will replace both the VH-3D and VH-60N aircraft. The program entered the JCIDS process in FY09 and shortly after Milestone B, during 2nd Qtr FY14, the Sikorsky S-92 was selected and designated the VH-92A. As we enter FY19 HMX-1 will see deliveries of the first three VH-92A aircraft along with the stand up of VH-92A maintenance support and training assets at the squadron.

The introduction of the VH-92A into HMX-1 operational missions will begin in 2020 with steady deliveries through 2023, coupled with commensurate retirement of In-Service assets. Additionally, two (2) CH-92A training assets will be added to HMX-1 in the FY23 timeframe. This addition will take advantage of training efficiencies and streamline squadron manpower throughput



MARINE HELICOPTER SQUADRON ONE

VH-3D/VH-60N:

The VH-3D/VH-60N have consistently and reliably supported the office of the President of the United States for decades. Deployed worldwide at a moment's notice, these aircraft provide a vital service ensuring the safe and timely travel of each president, his family, Cabinet officials, and visiting foreign heads of state.

VH-3D/VH-60N SERVICE LIFE EXTENSION PROGRAM (SLEP):

The VH-3D/VH-60N underwent a Service Life Extension Program (SLEP) beginning in FY15, which will extend the service life by 4,000 flight hours (each airframe). This SLEP is part of the necessary sustainment plan to maintain these aircraft until their scheduled replacement beginning in FY20.

In addition to the SLEP both aircraft will also receive planned upgrades and sustainment modifications in order to ensure mission effectiveness during this transition period. Some of these programs include weight reduction efforts and communications upgrades.

UPGRADES

VH-3D

- Weight reduction program
- Abbreviated Cockpit Upgrade Program
 - 1st install FY16
- Wide Band Line of Sight IOC 2017
- Service Life Extension Program

VH-60N

- Service Life Extension Program (FY17)
- Wide Band Line of Sight
 - IOC 2017



VH-92A PRESIDENTIAL HELICOPTER

Presidential exterior with highest quality finish and appearance

4,170 shaft horsepower main gearbox allows maximum engine power to be transmitted to rotor system for high/hot conditions

27,000 lb maximum gross weight allows for future growth capability

S-92 tail rotor blades with de-icing for all-weather operations

High efficiency S-92 main rotor blades for maximum cruise performance

Reliable CT7-8A6 engines provide HOGE power for all mission profiles

Proven reliable S-92 drive system

S-92 heated engine inlets for all-weather operations

Reliable low-maintenance S-92 main rotor head with manual blade fold

Windshield anti-ice for all-weather operations

6-foot cabin door height for dignified entry and exit

S-92 tail pylon does not require folding for C-17 transport

Fuel carried in sponsons for enhanced passenger safety

Impact attenuating S-92 landing gear

VH-92A Customization for Presidential Transport:

Standard S-92 Features

- S-92 Rotor ice Protection System (RIPS)
- S-92 RIPS warm weather kit
- VIP finish
- Cabin Cold Weather Heat
- Rear Entry
- Aux Pneumatic "Buddy Start"
- Enhanced Active Vibration Control
- Cockpit Cold Weather Heat

Standard S-92 Features

- Utility hydraulic distribution
- Environmental Control System

VH Unique Features

- Environmental Control System
- Fresh Air Inlet
- EMI/EMP hardening
- Avionics/Electrical modifications

MARINE HELICOPTER SQUADRON ONE

CURRENT FORCE TAI: VH-3D x 11
 VH-60N X 8
 MV-22B X 12
 UH-3D X 1
 UH-60N X 1

FORCE GOAL TAI: VH-92A X 21
 MV-22B X 12
 CH-92A x 2

		FY19				FY20				FY21				FY22				FY23				FY24				FY25				FY26				FY27				FY28				FY29							
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4				
UNIT/LOCATION	TAI																																																
HMX-1 QUANTICO	11 x VH-3D				H												D																																
	8 x VH-60N								H												D																												
	21 x VH-92A	H																			X																												
	1 x UH-60N																D																																
	1 x UH-3D																D																																
	2 x CH-92A																				H	X																											
	12 x MV-22B																																																

H = AIRCRAFT TRANSITION BEGINS D = AIRCRAFT DIVESTING X = AIRCRAFT TRANSITION COMPLETE

	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29
AIRCRAFT TYPE/TAI											
VH-3D	11	8	8	6	0	0	0	0	0	0	0
VH-60N	8	8	7	7	4	0	0	0	0	0	0
VH-92A	3	4	8	16	21	21	21	21	21	21	21
UH-60N	1	1	1	1	0	0	0	0	0	0	0
UH-3D	1	1	1	1	0	0	0	0	0	0	0
CH-92A	0	0	0	0	2	2	2	2	2	2	2
MV-22B	12	12	12	12	12	12	12	12	12	12	12
TOTAL HMX-1 TAI	36	34	37	43	39	35	35	35	35	35	35

GENERAL NOTES:

1) HMX-1 is located at MCAF Quantico, VA.

TAI – Total Aircraft Inventory

- Aircraft assigned to operating forces for mission, training, test, or maintenance functions
- Inclusive of mission, back-up, attrition, training, and depot aircraft



U.S. Marine Corps Aviation