2018 MARINE AVIATION PLAN

Section 1 Marine Aviation Strategic and Operational Posture

A MESSAGE FROM THE DEPUTY COMMANDANT FOR AVIATION

The Marine Corps is manned, trained, and equipped to be an expeditionary force in readiness - the nation's middleweight force - ready and forward deployed, capable of crisis response, entry and sustained operations across the range of military operations. Our Marine Corps exists to fight for the nation we serve, and Marine aviation exists to provide the MAGTF commander the flexibility and agility to conduct that fight at the time, place, and manner of his choosing. Marine aviation supports the ground forces of the MAGTF by contributing to battlespace dominance through air operations and power projection.

My four priorities for our aviation Marine Corps are simple. **First**, we will prepare to deploy to combat, and focus on readiness for combat. **Second**, we will modernize our force with new aircraft and systems, continuing our in-stride rebuild, refit and reset of our force to put reliable aircraft on the line and on the flight deck. **Concurrently** with these two efforts, we will support the maintainers, those experts who make our squadrons operate, by providing them with the leadership, career paths, and incentives that keep them on our team in order to retain and leverage their unique skills. **Finally**, we will focus on MAGTF integration, providing the day and night assault support and tactical aviation to a combined-arms fight anywhere in the world. These priorities are the framework on which we will build tomorrow's force.

Future Operating Environment

In 2015 Marine Corps Intelligence Activity (MCIA) published *Future Operating Environment (FOE) 2015-2025*. This document provides a baseline forecast of the future operating environment so the Marine Corps can anticipate future roles, missions and requirements. The FOE highlights five findings that will challenge the Marine Corps:

1. Adversaries will be capable of faster decision cycles and of creating and implementing information operation campaigns.

2. Adversaries will leverage the rapid development and proliferation of commercial technology to outpace the traditional military acquisitions process.

3. Future conflicts will be marked by ambiguity and uncertainty as to who the adversary is, what their objectives are, and even whether a state of war exists.

4. An increasing number of adversaries will acquire and develop anti-access / area denial (A2/AD) capabilities.

5. In future conflicts the information environment will be contested and leveraged for advantage.

Marine Corps Operating Concept

In 2016, in an effort to address the FOE and the evolving character of war, the Marine Corps published the *Marine Corps Operating Concept* (MOC) as its new capstone operating concept. To address the future operating environment the MOC identifies five critical tasks.

CRITICAL TASK: Integrate the Naval Force to Fight At and From the Sea

Marines are naval infantry. That force must get from ship to shore fast, at night or in terrible weather, as the operational commander gives battle at the time and place of his choosing. Marine aviation brings speed, agility and depth to the MAGTF's battlespace.

CRITICAL TASK: Operate with Resilience in a Contested-Network Environment

The naval tactical grid presents a unique operating environment. This is a mesh network, across which we pull information, and within which we must execute kinetic operations with a contemporaneous cyber fight. The Marine Corps is doubling down on our cyber and information warfare efforts; aviation is doubling down on onboard systems integration and hardening against a contested network environment. We are breaking ground with our Common Aviation Command and Control System, which as its name implies pulls together the MAGTF in to one common operational picture with greater precision and security.

A MESSAGE FROM THE DEPUTY COMMANDANT FOR AVIATION

CRITICAL TASK: Evolve the MAGTF

Distributed operations allow the MAGTF to extend its operational reach and enable maneuver at longer ranges, potentially several hundred miles beyond the shore. Scalable, pre-planned force packages balance logistics, maintenance, and ordnance needs with lighter footprints and rapid response times. These can be tailored and used for any aircraft in the Marine Corps inventory, and will be enabled by dedicated support from the aviation ground support and command, control, and communication communities. This is the fifth-generation aviation combat element (ACE).

CRITICAL TASK: Enhance Our Ability to Maneuver

Aviation creates decision space for operational commanders. The (ACE) has the ability to conduct distributed aviation operations (DAO), forward from the sea, in support of land and/or naval campaigns. DAO is a task-organized MAGTF operation, employing ACE aircraft in a distributed force posture, independent of fixed infrastructure. Doctrinally, the ACE conducts these operations from four types of forward operating bases (FOB): main air base, air facility, air site, and air point. Benefits for conducting DAO include increased operational reach, increased capacity, reduced risk in anti-access/area denial (A2/AD) environments, economy of force for major maneuver elements, flexibility, and surprise. We command and control all of this across the MAGTF and integrate into the naval integrated fire control-counter air (NIFC-CA) mesh as well.

CRITICAL TASK: Exploit the Competence of the Individual Marine

The Marine Corps is only as good as its Marines.

The MAGTF is a combined-arms force, built on the work of thousands of experts in their fields. We have highly-trained aviators flying our aircraft, with several million dollars invested per pilot. We have highly-trained maintenance experts working in the hangars, and in the same way we create Weapons and Tactics Instructors, we are now building out similar, rigorous formal certifications for our highly-trained maintenance Marines. These young men and women keep our aircraft flying. In turn, those aircraft keep the Marine Corps moving.

We are maximizing the competence of these Marines, capitalizing on their expertise and their experience, and we are determined to keep our best Marines in our Corps. It is incumbent upon us to show them a path to senior leadership, a clear progression through the ranks to both capture their knowledge and reward their good work.

The 2018 *Marine Aviation Plan*

The *Marine Aviation Plan* is an annual planning document, an iterative ten-year look at our plan to transition to new aircraft, keep legacy aircraft ready for combat, provide operational enablers and command and control, and build the **healthy and effective maintenance base** that makes this all happen. This document shows how we nest aviation missions and capabilities beneath the requirements in the MOC, and how we will continue to evolve the force – people, machinery, systems and processes – to better support the ground and joint force.

Headquarters Marine Corps Aviation lays out in the following pages how the aviation combat element will support the MAGTF over the next decade. This document shows how we will man, train and equip the force. We are ready to fight tonight, and we will be ready to fight tomorrow - in any clime and place.

Semper Fidelis,

LtGen Steven R. Rudder

Deputy Commandant for Aviation

READINESS FOR COMBAT

COMPREHENSIVE READINESS RECOVERY

Marine Aviation will improve readiness by adhering to procedures, focus on training practices, and managing an effective maintenance program to improve aircraft readiness, increase training capacity, and increase readiness for combat.

Across all of Marine aviation, **readiness is below steady-state requirement**s. This reduces our ability to surge during crisis response or major combat operations. High operational tempo, staffing challenges in critical military occupational specialties, insufficient materiel support, unpredictable funding, and an aging aircraft inventory have forced resource tradeoffs and reallocations across the Marine aviation enterprise.

We have empaneled independent readiness review teams to give impartial recommendations on how to best improve readiness in the AV-8B, CH-53, MV-22 and H-1 communities. Building on the success of these processes, we have initiated F/A-18 and aviation enabler readiness reviews. These readiness recovery initiatives focus on our people, processes, parts, and funding and are a key component of improving our overall readiness.

Given our current readiness levels, and the realities of an aging aircraft inventory, we know readiness will be a persistent challenge. To confront these challenges Marine aviation has prioritized current readiness initiatives and modernization efforts.

We can influence Marine aviation's people, processes and procedures to keep ready aircraft on the line as we transition to new airframes and systems.

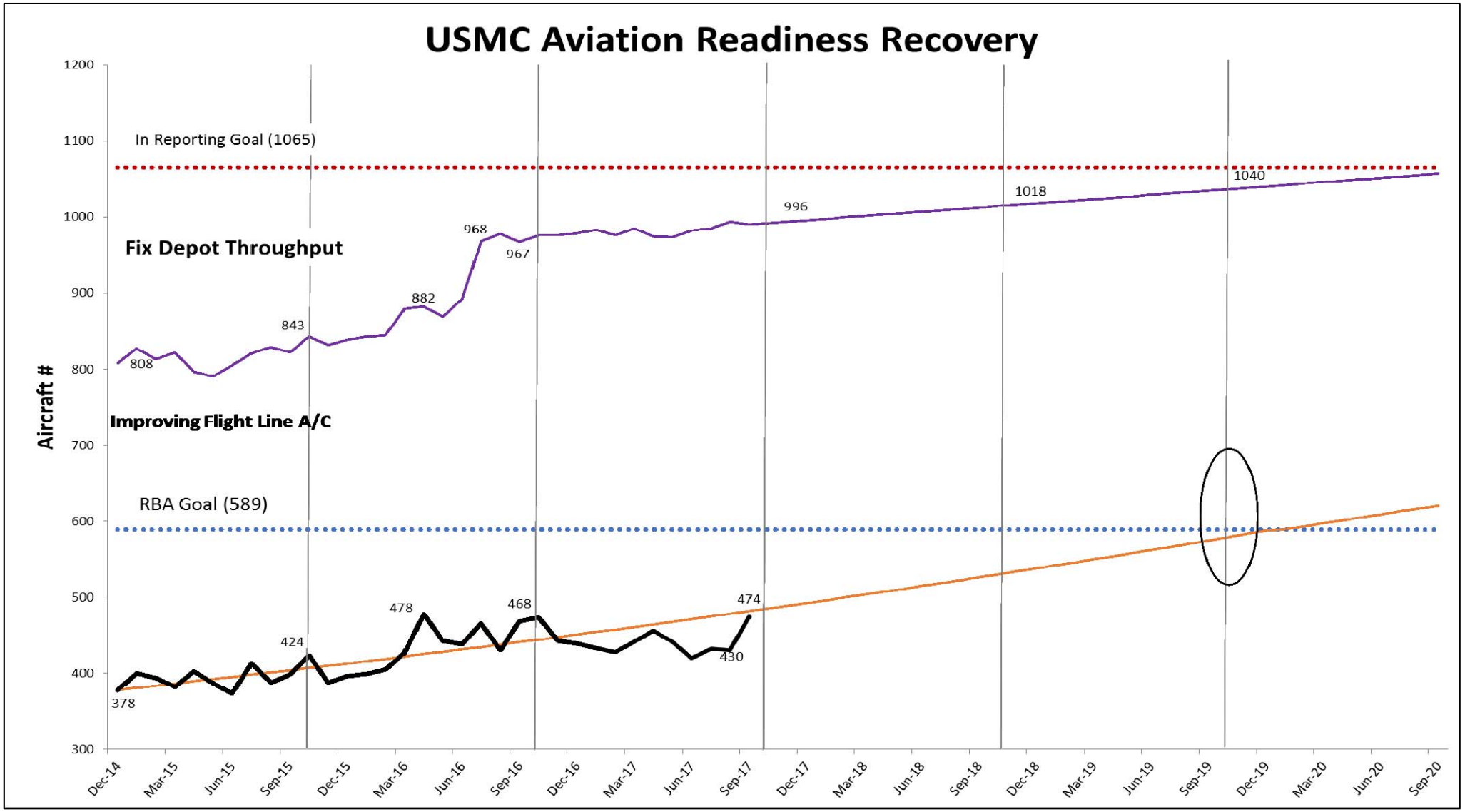
READINESS FOR COMBAT

READINESS MINDSET

The Marine Corps does not do tiered readiness, but is a force ready for combat. Fiscal environments forced a decision to resource forward deployed operations at the expense of the CONUS flight lines. Today, the challenges continue as the Marine Corps stair steps its way back to the force in readiness.

Funding of readiness accounts returned to executable levels in FY18. This increased readiness funding affords the Marine Corps maneuver space to ensure recovery of training capability by FY20 (T2.0) and a ready bench by FY22.

Marine aviation must be diligent and focused in this recovery. Disciplined flight time, focused training, and precise utilization will ensure a balanced approach to recovery and a mind shift to readiness for combat.



INDEPENDENT READINESS REVIEWS (IRRs)

IRRs are an **unbiased, in-depth, outside look** at Marine aviation practices to gain efficiencies and improve flight line readiness in every type/model/series. Additionally, a ground mishap review attempted to gain insight into maintenance practices that cause self-induced readiness degradation.

Findings of these analyses resulted in implementation of four lines of effort designed to increases the quantity of ready aircraft to satisfy both training and warfighting requirements.

These lines of effort are:

1) Fix depot throughput;
2) Reduce in-service repair time by 50%;
3) Reduce Non-Mission Capable – Supply (NMCS) to 10%;
4) Reduce Non-Mission Capable – Maintenance (NMCM) to 10%;

AV-8B IRR:

- Commissioned late FY14.
- Established a goal of 66 RBA by June 2016.
- Achieved RBA goal July 2016

The Harrier Independent Readiness Review (HIRR) identified a cost-effective strategy to maintain sustainment through the platform's service life. Results focused on maintenance and material RBA degraders, depot maintenance timelines, management of the supply system, and contract and USMC manpower. A holistic analysis of the supply forecasting model for the F402 engine and overall airframe resulted in improvements in the logistics system.

Readiness improvement and closing the RBA gap focuses on 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)

CH-53 IRR

- Commissioned early FY15.
- Main effort: Reset of all 143 CH-53Es by 2020.
- Objective: 67 RBA by 2QFY18, and 86 (75% of FLE) by FY20

Sixteen years' combat operations have stressed the limited number of these aging airframes. Maintaining readiness in the CH-53E community has forced leadership to direct multiple lines of effort to sustain this 28 year old airframe.

The CH-53E readiness recovery effort is a continuous process implementing recommendations from the Super Stallion Independent Readiness Review (SSIRR).

The SSIRR recovery plan has multiple lines of effort, with the largest being reset of the entire 143-aircraft fleet by FY20. Reset is a comprehensive maintenance process which addresses the degraded material condition of the fleet and facilitates continued sustainment of the Super Stallion.

Reset validation began in the 4th quarter of FY15 and is now in full rate production in 1st MAW, 2nd MAW and 3d MAW.

READINESS FOR COMBAT

The goal of the SSIRR was to set the conditions in which the **CH-53E community could achieve T-2.0 and sustain it through Full Operational Capability of the CH-53K in 2029.** The CH-53K King Stallion is the heavy lift solution which addresses capability gaps as well as readiness, but this program will take over ten years to field.

Limiting factors that contribute to reduced readiness include:

- Inventory shortfalls combined with complex modifications, technical directives and upgrades necessary to sustain the CH-53E remove aircraft from the flight line for extended periods of time.
- Depot level performance continues to fall short, creating longer turn-around times
- The supply system is not able to keep pace with material demands (35.65% NMCS)
- Aging platforms have reduced readiness levels
- The quality of maintenance training curricula, maturation and standardization has not kept pace with basic skills and improved/updated standards

Readiness improvement opportunities are being sought in reset, configuration management, reliability, supply, obsolescence, manpower, maintenance training, and pilot/aircrew functional check flight training.

Other readiness efforts include the procurement of Individual Material Readiness List (IMRL) and support equipment (SE), correction of all Technical Publication Discrepancy Reports (TPDRs), the introduction of two AMARG reconstituted MH-53E aircraft for stick and rudder training at HMHT-302, contract maintenance field teams, and fully funding Program Related Logistics (PRL).

In the realm of Performance Based Logistics (PBL), the CH-53E currently has 10 components on contract. By 2QFY18 it is expected to have another 65 components with efforts to pursue additional components in the near future.

CH-53E readiness recovery has yielded an increase of 10 RBA since last year with an average T-rating of T 2.6 within the community.

Improvements include: procurement of full complement of test equipment and IMRL; implementing engine fuel control recovery efforts; and temporarily adjusting squadron aircrews to match flight hour supportability, thereby allowing squadrons to achieve and maintain T-2.0.

Sustainment efforts include: fully resourcing CH-53E program related logistics (PRL) activities to appropriate levels for sustainment of an aging aircraft,; increasing technical support assistance to squadrons; increasing quantity & quality of training at the squadron level, and accelerate transition to T-64-GE-419 engines.

The recovery plan is also pursuing a Phase II and Phase III Comprehensive Performance Based Logistics (CPBL) contract as a means to implement a long term sustainment strategy for supply chain improvement.

MV-22 IRR:

- Commissioned May 2016
- **Main Effort: Common Configuration Reliability and Modernization (CCRAM)** Program improves reliability, decreases maintenance man hours and sustainment costs by reducing logistics footprint and complexity.
- Objective: 82% readiness fleetwide by completion of CCRAM

Readiness improvement opportunities span configuration management, reliability, supply, manpower, and maintenance – all key issues that can limit readiness. These include:

- There are over 75 V-22 aircraft configurations and modifications
- System / component improvements are under resourced
- The supply system is not able to keep pace with material demands (34% NMCS)
- Depot-level maintenance cannot keep up with demand
- The quality of maintenance training curricula, maturation, and standardization has not kept pace with readiness requirements
- Current maintenance manning levels are unable to support demands for labor

The current V-22 sustainment system cannot realize improved and sustained aircraft readiness / availability without significant change. Since the MV-22 Operational Independent Readiness Review (OIRR), decisions have been made to implement the CC-RAM plan along with nacelle improvements.

The V-22 program will also pursue a plan and strategy for PBL Implementation to select “best of breed”, confirm a modification manager/authority, continue to implement a long-term sustainment strategy, develop a detailed PMI plan, pursue commercial PMI capability, and improve the supply chain.

The OIRR shall lead to improvement of aviation support programs in association with advanced maintenance concepts and equipment, in order to provide increased and sustained levels of readiness across the Marine Corps. Development of analytical modeling tools shall demonstrate the feasibility and maturity of new technology and gain understanding in order to evaluate utility of this technology to expedite delivery of new capabilities.

H-1 IRR

- Commissioned late FY16.
- Main Effort: NMCS with adequate spares procurement to meet fleet requirements.
- Objective: Long term utilization strategy and sustainment

The HMLA Operational Independent Readiness Review (OIRR) that was completed in March 2017 made the recommendations that spanned configuration management, reliability, supply and manpower disciplines:

- System / component improvements are under-resourced
- The supply system is unable to keep pace with material demands
- Depot-level maintenance cannot meet demand
- The quality of maintenance technical publications, maturation, and standardization has not kept pace with readiness requirements.
- Current maintenance manning levels are unable to support demands for labor

The OIRR made recommendations to improve aviation support programs. Armed with these recommendations, program management and supply support agencies continue to work with our industry partners to ensure a sustainment strategy is in place to provide a high state of readiness for the platform. Headquarters Marine Corps will continue working with all stakeholders to implement a sustainment strategy which improves fleet readiness. The strategy challenges the Defense Logistics Agency (DLA) to support specific requirements under the framework of a DLA "Captains of Industry" (COI) contract which should be awarded in Feb 2018.

In addition to the COI contract, NAVSUP plans to award a Performance Based Logistics (PBL) contract (June 2019). The goal of this sustainment strategy is to provide the Fleet with sufficient RBA to meet T-2.0 training requirements and includes the following six lines of effort (LOE):

- Reliability, Maintainability, and Supportability (RM&S)
- Flight-line Support
- Depot Capability
- PMA-276 Sustainment Efforts
- Consumable Material Availability
- Supply Support

Additional efforts underway include reliability improvements of key components, a fleet wide technical review, and depot stand up and reinforcement:

- Whether caused by improper design, manufacturing quality issues, or components simply at the end of their useful life, components with sub-optimal performance degrade readiness. The scope of the effort to correct component reliability includes minor component updates up to subsystem redesign.
- H-1 Pubs Modernization - deficiencies in H-1 Technical Publications were identified as a concern during the 2016 Executive Supportability Summit (ESS). Based on this concern, a Pubs Health Assessment was conducted and identified the following improvement opportunities: converting the H-1 Pubs to the S1000-D, fielding a Common Connected Portable Electronic Maintenance Aid (PEMA) (CCP) solution, introducing WIFI to the flightline for ease of search and update, and implementing the changes recommended during a series of fleet user publication reviews. It also introduces an improved interface to enable video capture for detailing complex maintenance tasks. This effort is on schedule for completion in FY21.
- Depot capability was delayed in 2009 primarily to support the "Yankee Forward" strategy. PMA-276 will continue the process of establishing organic depot capability at four depot repair facilities and this effort is focused on components that have the greatest impact to readiness.

READINESS FOR COMBAT

AVIATION GROUND MISHAP REVIEW

- Commissioned late FY16.
- Identifying mishap root causes that exacerbate readiness.
- Completed Jan 17

During FY17 there were more than 70 aviation mishaps reported to Headquarters Marine Corps. More than 50 of these were Class C mishaps, resulting in the loss of 41 aircraft available to contribute to combat readiness.

The Aviation Related Ground Mishap (ARGM) Independent Readiness Review identified root causes and delivered actionable recommendations that enable Marine Corps Aviation to address and reduce the ground mishap rate, preserve aviation assets, and fulfill its training and readiness requirements.

The study found that the **rise in aviation ground mishaps is a consequence of a maintenance culture shift** engendered by post-9/11 operations and are one of many variables that are depressing Ready Basic Aircraft rates in Marine Corps aviation.

These ground-related mishaps are preventable and require the attention of all professional aviators and maintainers.

Key observations:

- Normalized deviance - grooming aircraft is a lost art
- Leadership supervision – Staff Non-Commissioned Officers are over-tasked with administrative duties, hampering their ability to focus on the flight line
- Inadequate technical expertise
- Safety and maintenance programs are not standardized
- Lack of safety expertise in the squadrons
- Administrative tasks are saturating focused workloads
- Aircraft transfers are consuming maintenance practice

F/A-18 IRR

- In progress

MACCS IRR

- In progress

AVIATION ENABLERS

	CURRENT READINESS	FUTURE READINESS
D	•JP 3-02, CMC FRAGO, AVPLAN, MCOC	•MACCS ISO Future Concepts Primer •**MACCS ConOps**
O	•FF 2025 •**Opportunities to Reorganize**	•GBAD Capacity and Capability •**MWSG HQ**
T	•Bold Alligator, Dawn Blitz, •Organic Simulation	•MAGTF VWC •ACTS Transitions
M	**Fielding AC2 family of systems CAC2S, TPS-80, CTN, P-19R, SLS**	
	•**CAC2S Amphib + F35 Integration** •TPS-59 Sustainment + TBM Upgrades	•TPS-80 FMS •Future of Precision Approach
L	•Leadership Development •**7200 and 5900 SNCO Capacity/Ready Bench**	
P	•MOS Modeling •MOS Manual Updates	•Retention Strategy
F	•MASS-1 Complex •MACS-2 Facilities Project (P-129)	•Force Protection Upgrades

Align Aviation Enablers to Support a 2025 MAGTF

MACCS Independent Readiness Review Informs all DOTMLPF Efforts

READINESS FOR COMBAT

MOS INITIATIVE

Historically, aviation readiness has been inextricably linked to qualifications and designations of our personnel. The Military Occupational Specialties (MOS) Initiative will improve our readiness through **increased visibility of trained and experienced personnel.** The MOS initiative will inform assignment, retention, and promotion processes in an effort to optimize the return on investment in Marine aviation training.

The FY18 MOS Manual published aviation specific necessary MOSs (NMOS) in order to identify particular skills or training. The MOSs depicted in the following tables are tied to critical readiness enablers. As our enlisted and Marine officers attain flight leadership, instructor and maintenance inspector ratings, they will have the ability to run these NMOSs as additional MOSs in the Marine Corps Total Force System (MCTFS).

NMOS	DESCRIPTION	PMOS PREREQUISITES
7533	Aircraft Section Lead	Any PMOS from OccFld 75 and 8042
7534	Aircraft Division Lead	Any PMOS from OccFld 75 and 8042
7535	Flight Leader	7532, 7563, 7565, 7566, or 8042
7536	AV-8B Weapons Training Officer	7509 or 8042
7537	Marine Division Tactics Course Qualification	7518, 7523, 7525, or 8042
7538	EA-6B Defensive Tactics Instructor	7543, 7588 or 8042
7539	AV-8B Air Combat Tactics Instructor	7509 or 8042
7542	Strike Fighter Tactics Instructor	7518, 7523, 7525, or 8042
7544	Forward Air Controller (Airborne) Instructor	7509, 7518, 7523, 7525, 7563, 7565, or 8042
7547	Night Systems Instructor	Any PMOS from OccFld 75 and 8042
7573	Strategic Refueling Area Commander	7557 or 8042

NMOS	DESCRIPTION	PMOS PREREQUISITES
6012	Maintenance Control Safe-For-Flight	Any PMOS from OccFld 61, 62, 63, 65
6015	Collateral Duty Inspector	Any PMOS from OccFld 61, 62, 63, 65
6016	Collateral Duty Quality Assurance Representative	Any PMOS from OccFld 61, 62, 63, 65
6017	Quality Assurance Representative	Any PMOS from OccFld 61, 62, 63, 65
6018	Multi-system QAR	Any PMOS from OccFld 61, 62, 63, 65
6516	Quality Assurance Safety Officer	Any PMOS from OccFld 65 and 6048

Section 2 Marine Aviation Platforms, Enablers, Total Force

2.1 Type/Model/Series: Fixed Wing, Rotary Wing, Tiltrotor, UAS, OSA

2.2 Marine Aviation Expeditionary Enablers

- Marine Aviation Command and Control System
- Aviation Ground Support

2.3 Marine Aviation Logistics Plan

2.4 Marine Aviation-Unique Commands: MAWTS-1, VMX-1, HMX-1

2.5 Reserve Integration and the Total Force

2.6 Tactical Air Control Party

2.7 Weapons

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. Such design enables JSF to be lead element in a flight and to shape the MAGTF fight.

The F-35 has an autonomous capability to strike a broad range of moving or fixed targets, either day or night and 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 the 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, less exposure to threats, and retains the element of surprise.

Together these elements allow the pilot to control the tactical environment using proactive 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 additional flexibility and persistence operating from conventional aircraft carriers or land bases.

The US Marine Corps procurement of both the F-35B and F-35C variants will provide needed replacements to our aging AV-8B and F/A-18 4th generation aircraft and our 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 = 15,000 pounds; F-35C = 18,000 pounds
- Max Gross Weight: F-35B = 61,500 pounds; F-35C = 70,400 pounds
- Internal Fuel: F-35B = 14,000 pounds; F-35C = 20,000 pounds
- Speed (Cruise w/ Attack Payload): .94M / Top speed: 1.6M
- Combat Radius:

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, GP Bombs, 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

- F-35B = 450 nm; F-35C = 600 nm
- **Attack (OAS)**
  - **Combination of Air to Air Weapons and Air to Surface Weapons (DAS)**
  - **Air to Surface Weapons; with capability for auxiliary mission equipment (external pylons with 3F)**
- 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 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)

The aircraft is currently tracking to reach its full program-of-record operational capability (Block 3F) 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.

In 2018 VMFA-121 will support a MEU detachment early in the new year, and VMFA-211 will support a separate MEU detachment in the summer.

Also in 2018, VMFA-122 will execute its safe for flight as an F-35B squadron at MCAS Yuma.

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 which will put them at a T2 rating by the middle of FY 2021, and they will start deployment workups by the end of 2021.

VMFA-225 is not far behind VMFA-314, also transitioning from an F/A-18 squadron, which will remain in Miramar, to F35-B in in 2020 as well. VMFAT-502 is currently planned to stand up in first quarter FY21 as the second USMC F-35B FRS in order to meet the exponential increase in USMC F-35B pilot training requirements.

In order to support transitions to F-35C, the Marine Corps has delivered eight F-35Cs to the joint Navy/Marine Corps FRSs located in Eglin AFB and NAS Lemoore. The USMC is currently contributing F-35C instructor pilots and maintainers at both locations to support training requirements.

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

MANPOWER

Overall, the requirements of TMS-specific MOSs in the Marine F-35 community continues to grow on par with squadron transitions. HQMC continues to work with fleet representatives to ensure a coordinated plan that provides 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) is being updated to reflect the F-35 transition as depicted in this year's AvPlan. The F-35 cell 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.

Aviator Staffing

MOS 7518 pilot production continues to increase CAT I pilot training in FY18 while continuing to transition legacy TACAIR CAT II pilots for key F-35 squadron billets. F-35C FRS instructor pilot production is still underway in order to be positioned in FY19 to accept F-35C CAT I and II pilots in subsequent years.

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.

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 now being researched for possible inclusion. Although the Marine Corps is currently under a moratorium limiting changes to current force structure, there are plans to adjust squadrons to add these maintenance capabilities.

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.

SUSTAINMENT

Reliability and Maintainability Improvement Projects (RMIP) have completed 38 projects to date which significantly benefit sustainment. 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) was completed in January of 2016; this identified 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. Timeframe for implementation is targeted for 2019 pending infrastructure, personnel, and training availability.

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 JSF program continue to improve the model in order to provide higher levels of readiness at a potential cost reduction.

Depot Repair Cycle Time (DRCT) is the major focus area for program development. The program office has activated 13 of 70 depot level component repair capabilities and another 27 are in negotiation to be stood up under the next contract – this will complete all of the high impact parts requiring depot level repair.

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.

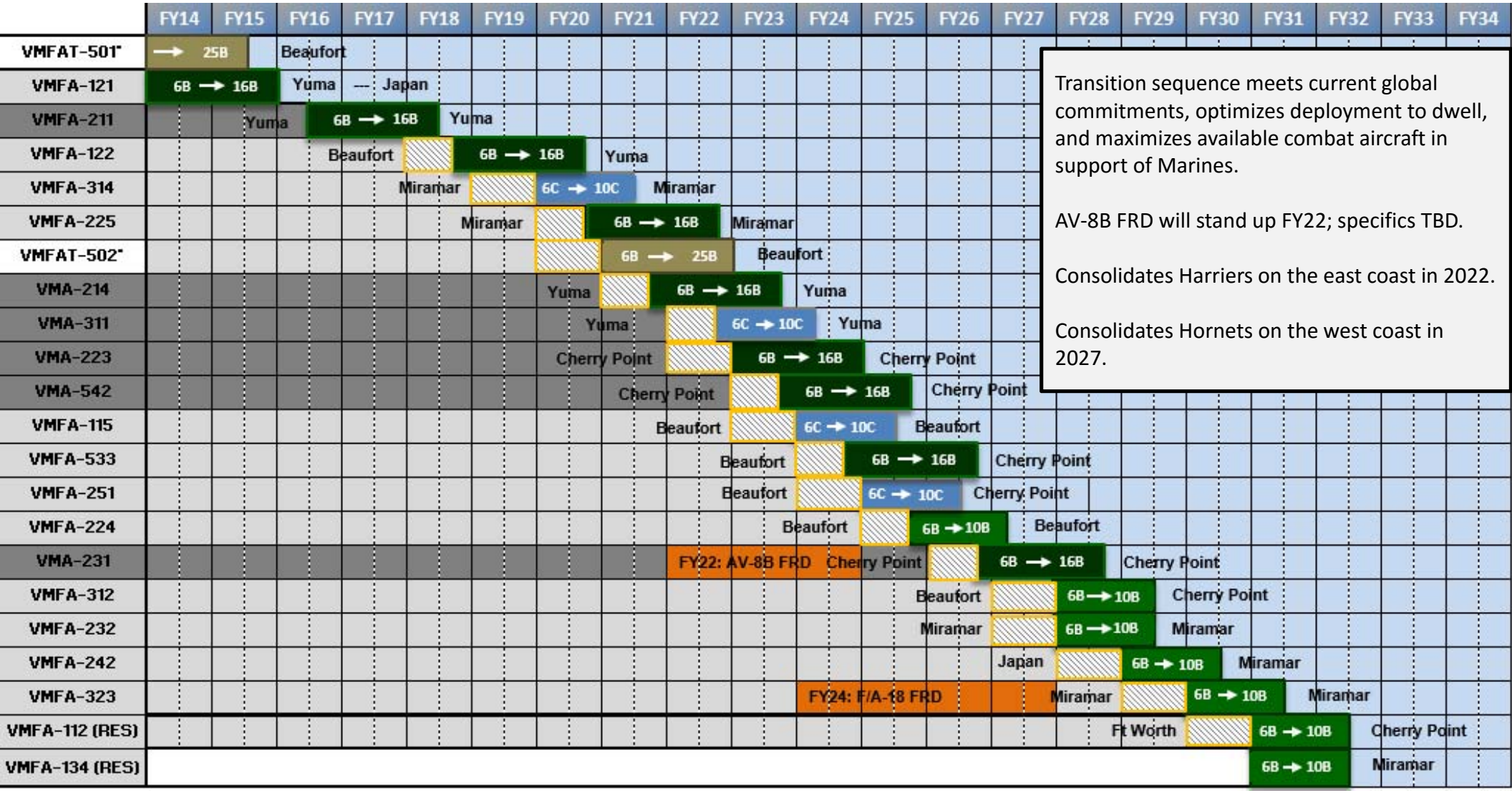
RESERVE INTEGRATION

The transition of VMFA-112 and VMFA-134 to the JSF remains 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) will be established at VMFAT-501 and support F-35 FRS flight operations in FY18.

CURRENT FORCE PAA:
6 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 SQDN x 25 F-35B

F-35B AND C LIGHTNING II TRANSITION PLAN

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



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; specifics TBD.

Consolidates Harriers on the east coast in 2022.

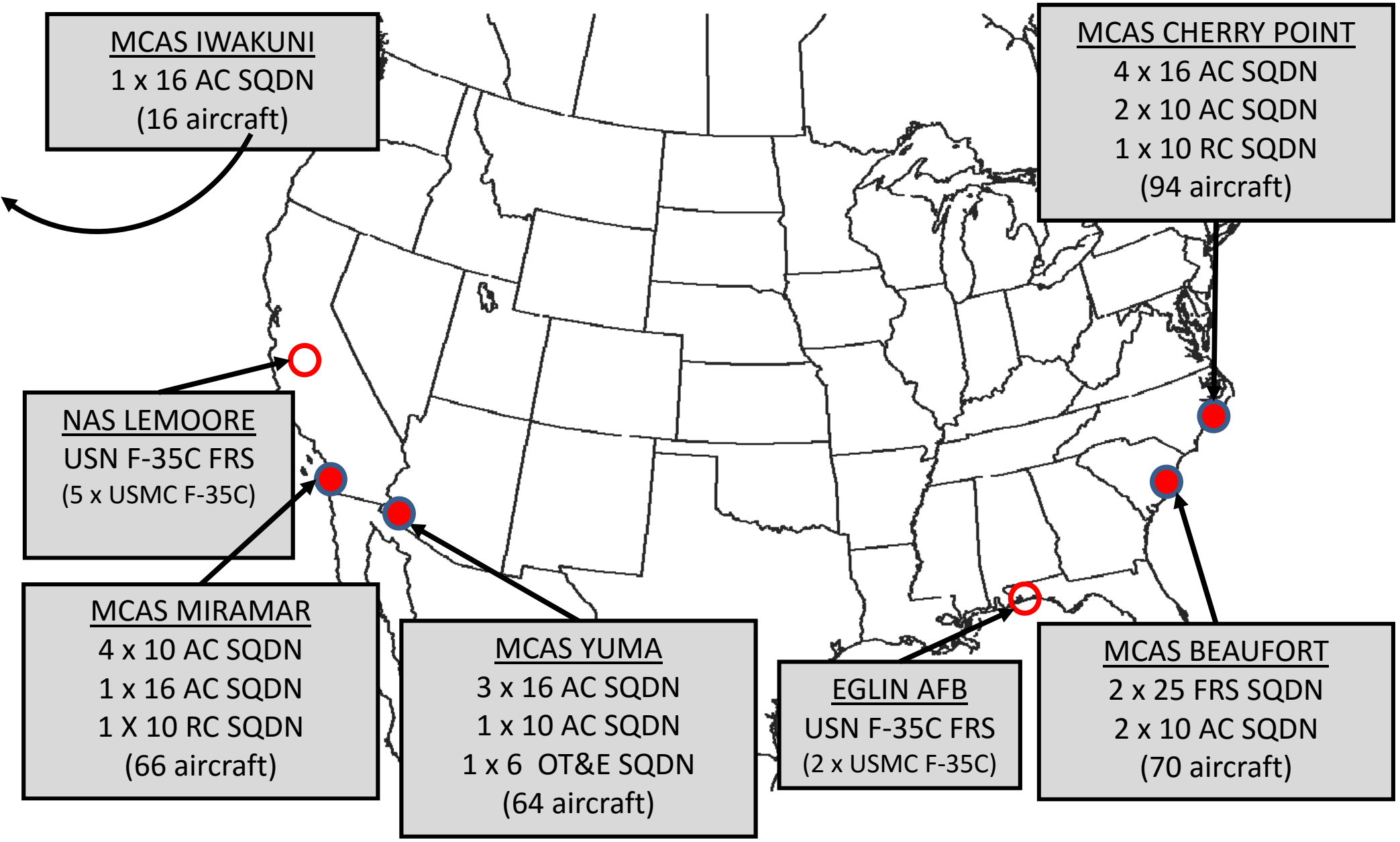
Consolidates Hornets on the west coast in 2027.

This signifies the transition of structure from the legacy platform to the F-35
The left side aligns with the re-designation of the squadron on in Qtr 1 of FY
The right side aligns with the squadron achieving safe-for-flight
Legacy flight ops cease during this period based on operational requirements

16B
10B
10C

-The left side aligns with the squadron achieving safe-for-flight
-The right side aligns with the squadron achieving FOC
(24 months for 16 plane sqdns, 18 months for 10 plane sqdns)
-F-35C squadrons - the left side aligns with FRS flight ops at VFA-125

F-35 BASING PLAN



Indicates detachment

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

INITIATIVES AND WAY AHEAD

The JSF is the future of all TACAIR for the Marine Corps. As we replace our legacy fleet and transition to the JSF, the ACE's contribution to the MAGTF will continue to evolve as new technologies enable greater flexibility in mission execution.

As the single TACAIR replacement and centerpiece of the MAGTF Aviation Combat Element, the JSF must also continue to evolve. This evolution over the next five years will focus on:

1) Detachment capability for all VMFAs (manpower, equipment, training, mobile facilities)

2) Military construction across the Marine Corps to include upgrades to facilities and sustainability for the growing fleet

3) Aircraft survivability equipment upgrades

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

INITIATIVES AND WAY AHEAD

Research, Development, Test & Evaluation (RDT&E) is fully integrated into the procurement of all F-35 variants. Highlights in current and future technologies:

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)
- Ground Moving Target Indicator (GMTI)
- MADL, Link16, VMF datalinks
- Can perform all USMC TACAIR Mission Essential Tasks (METs)
- Night and Poor Weather Capable
- LHD/LHA Shipboard Operations

Block 3F: Full Warfighting Capability (**May 2018**)

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 & VMF/Strikelink suite.
- Automatic Target Recognition
- Ground Moving Target Tracker (GMTT)
- Enhances capability to execute TACAIR METs due to reduced workload, better sensor and weapon capability.
- CVN Operations
- Interim Full Motion Video (FMV)

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 : Ongoing efforts include:

1) Close out of Block 3F test points in order to complete System Development and Demonstration (SDD)
2) Transition to Follow-on-Modernization (FoM)

OPERATIONAL TEST AND EVALUATION : Ongoing efforts include:

1) Official Initial Operational Test & Evaluation (IOT&E) begins in FY18
2) Defensive weapon system envelope expansion
3) Digital interoperability
4) Integrated Aircraft Survivability Equipment

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

VALUE TO THE MAGTF

The F/A-18A-D Hornet, with its complement of advance precision guided weapons, advanced LITENING targeting pod, network interoperability, and beyond visual range air-to-air missiles provides relevant and lethal capability to the MAGTF and combatant commanders.

F/A-18s remain the primary bridging platform to F-35B/C with a planned sunset of 2030. Hornets will consolidate on the west coast by 2027 with the exception of VMFA (AW)-242, which will remain assigned to MAG-12 at MCAS Iwakuni until a scheduled F-35B transition in 2028.

The F/A-18A-D community continues combat operations for the sixteenth straight year as Hornets support Operation INHERENT RESOLVE: Land-based with SPMAGTF-CR and shipboard on aircraft carrier deployments as part of our TACAIR Integration (TAI) commitment.

The USMC fleet will have 10 active squadrons and one reserve squadron in 2018. As transition to F-35 continues, VMFAT-101 will sundown in FY23 and 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
- 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, Intrepid Tiger II
- ASE: ALE-39/47, ALQ-126B, ASPJ-165, ALR-67v2&3

Notional Mission Profile

- OAS
  - Range/Time on Station (TOS)- 150nm transit, 45 TOS, 150nm RTB
  - Loadout- (2) GBU-38, (2) GBU-54, (2) AIM-9X, (1) AIM-120 (500) 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: (1) F/A-18A++ (2) F/A-18C (1) F/A18-D (1) FRS
3) MAG-12: (1) F/A-18D
4) MAG-41: (1) F/A-18A++/C+ (reserves)
5) Two Squadrons x 25 F-35B FRS (transition squadrons)

TAI: Currently the Marine Corps has two TAI squadrons allocated to USN CVWs. The Navy and Marine Corps will increase TAI levels to three, and eventually four with the F-35C. The Marine Corps is committed to TAI and the F-35C program with IOC of the F-35C expected in August 2018. VMFA-314 will transition in FY19 and execute the first USMC F-35C deployment in FY21 with CVW-11.

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 until sundown of the Hornet.

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. 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.

SUSTAINMENT

As an out-of-production aircraft, the F/A-18A-D program is focused on addressing readiness degraders, solving chronic material shortfalls, and closing the RBA 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 currently 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. 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 monitoring USN divestment, planning an aggressive strike/store plan, and implementing re-engineered end of life PMI events.

This 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 in MCAS Miramar and/or MCAS Beaufort. This will provide 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. Additionally, an independent readiness review has been initiated by HQMC to identify 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 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 210 Lot 17 and below aircraft and the HFH inspection has extended the life of more than 160 DoN F/A-18A-D aircraft beyond 8000 hours.

In parallel to 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 aboves", while simultaneously relieving the squadron level maintenance department of inspection requirements. The first verification HFH/PMI 1X events were being inducted in late 2016.

RESERVE INTEGRATION

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

CURRENT FORCE PAA:
6 AC VMFA SQDN x 12 F/A-18 A++/C
4 AC VMFA(AW) SQDN x 12F/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

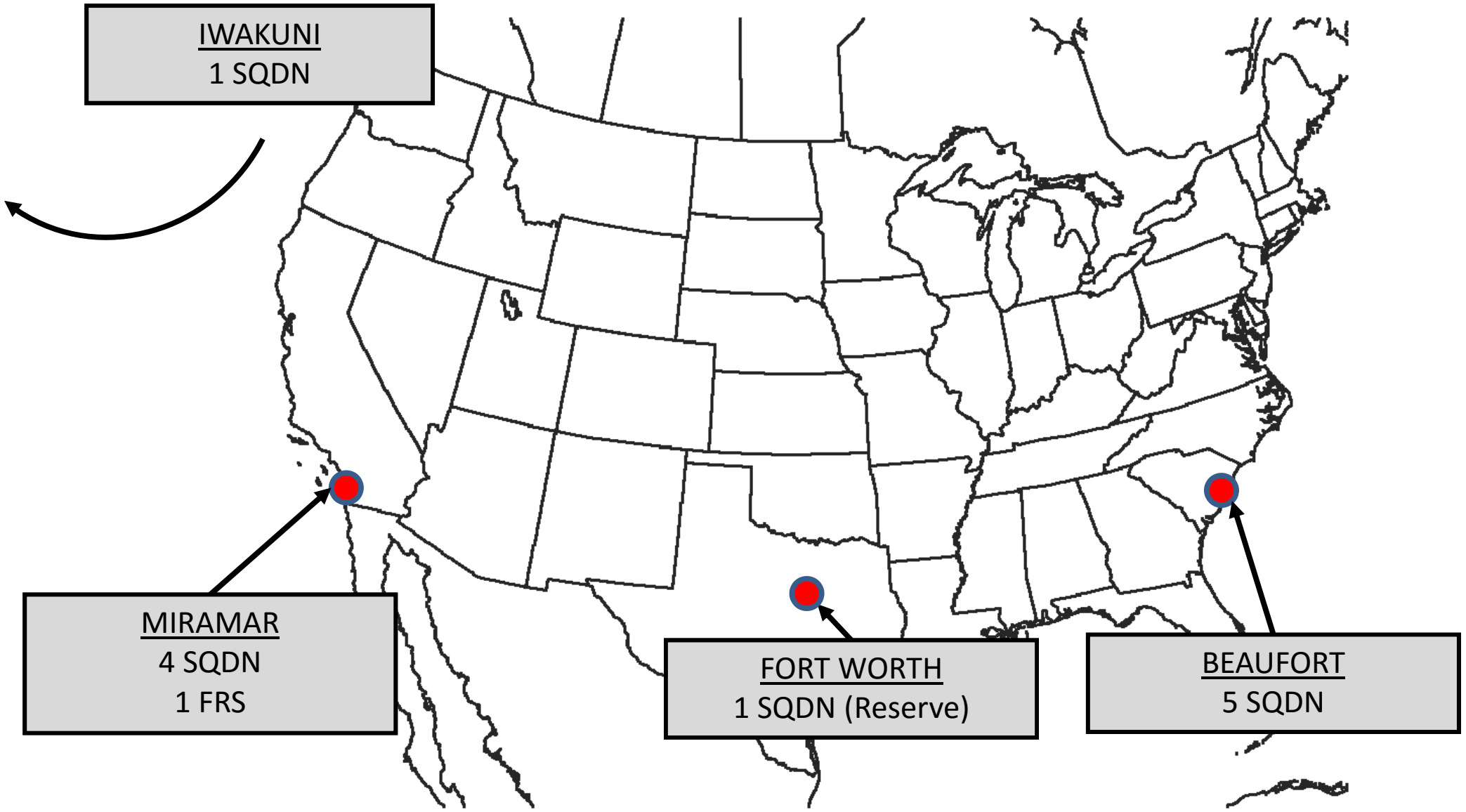
		FY18				FY19				FY20				FY21				FY22				FY23				FY24				FY25				FY26				FY27			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
MAG-31 Beaufort																																									
VMFA-115	12 F/A-18A++/C+																									C			V	F-35C Squadron											
VMFA(AW)-533	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																																								
F/A-18 SIMS	4																																								
MAG-11 Miramar																																									
VMFA-314	12 F/A-18A++							C					V	F-35C Squadron																												
VMFA(AW)-225	12 F/A-18D									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															
F/A-18 SIMS	6																																								
MAG-12 Iwakuni																																									
VMFA(AW)-242	12 F/A-18D																																								
MAG-41 Fort Worth																																									
VMFA-112	12 F/A-18A++/C+																																								
AC/FRS/RC/FRD TOTAL UNITS		10/1/1/0				9/1/1/0				8/1/1/0				8/1/1/0				8/1/1/0				8/1/1/0				6/0/1/1				5/0/1/1				4/0/1/1				4/0/1/1			
AIRCRAFT TOTALS		179				167				149				149				147				142				102				78				74				74			

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-18AD is nearing the final fit for adding capabilities.

1) Avionics and software upgrades (LINK-16, RNP/RNAV, Mode 5/S, ADS-B out)
2) Weapons modernization (AIM-9X Block II, AIM-120C, APKWS warhead and envelope expansion, JSOW)
3) Digital interoperability (LITENING ATDL, high definition video wireless to the cockpit, VMF)
4) Increased survivability (ALQ-214 v5 / ALR-67 v3, Auto Ground Collision Avoidance System (AGCAS))
5) Readiness (PRE/PRL, F402 engine safety/reliability, FOD programs, AI-684 / PMI 1X/2X, Contract Maintenance Support for O-Level)

FINAL FIT:

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

LETHALITY:

AIM-9X Block II – 2018
AIM-120D – 2016
APKWS – 2018

ELECTRONIC WARFARE :

Intrepid Tiger II V 1 Block X – 2021-22
ALR-67 v3 - 2018
ALQ-214 v5 - 2018
LITENING pod Gen 4 -

INTEROPERABILITY :

LINK-16 – MIDS JTRS (CMN-4)- scheduled to begin fielding in 2018

RELIABILITY:

Solid-state recorders – 2016

AV-8B HARRIER (VMA) PLAN

VALUE TO THE MAGTF

The AV-8B Harrier with its complement of advance 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 short takeoff / vertical landing (STOVL) aircraft, the AV-8B provides USMC TACAIR basing flexibility to the MAGTF; the Harrier has been and continues to be the premier TACAIR platform aboard the MEU.

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

The AV-8B's lethality, coupled with the close proximity to littoral targets, rapid turnaround time, and hot reloading of weapons offered by our unique amphibious basing, provide unique abilities of STOVL TACAIR aboard the 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 & 1000 pound JDAM/LJDAM, laser guided, and general purpose bombs; CBU-99/100; CBU-78; MK-77; 2.75 and 5.0 inch 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, Intrepid Tiger II
- ASE: ALE-47 ECM, ALR-67 RWR, ALQ-164 DECM Pod

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 current AvPlan maintains five operational squadrons until FY21. West Coast VMAs complete transition to F-35 in FY22, and the East Coast maintains operations until FY26.

FRS

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

The FRD will not produce CAT I pilots; it will only complete 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 F-35B transition policy letter and will be balanced against VMA manpower requirements.

SUSTAINMENT

The current AV-8B active inventory consists of 126 aircraft. There are 16 TAV-8B training aircraft, 34 night attack aircraft, and 76 radar aircraft. The AV-8B fleet is currently fulfilling, with five squadrons, the operational commitments previously filled by seven squadrons. Additionally, squadron flightlines increased from a PMAA of 14 to 16 in June of 2016.

To date, there has been 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. The lessons learned and process improvements of 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-35B.

CURRENT FORCE PAA:
5 AC SQDN 16xAV-8B
1 FRS 13xAV-8B, 13xTAV-8B
1 DT/OT 4xAV-8B

AV-8B HARRIER (VMA) 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

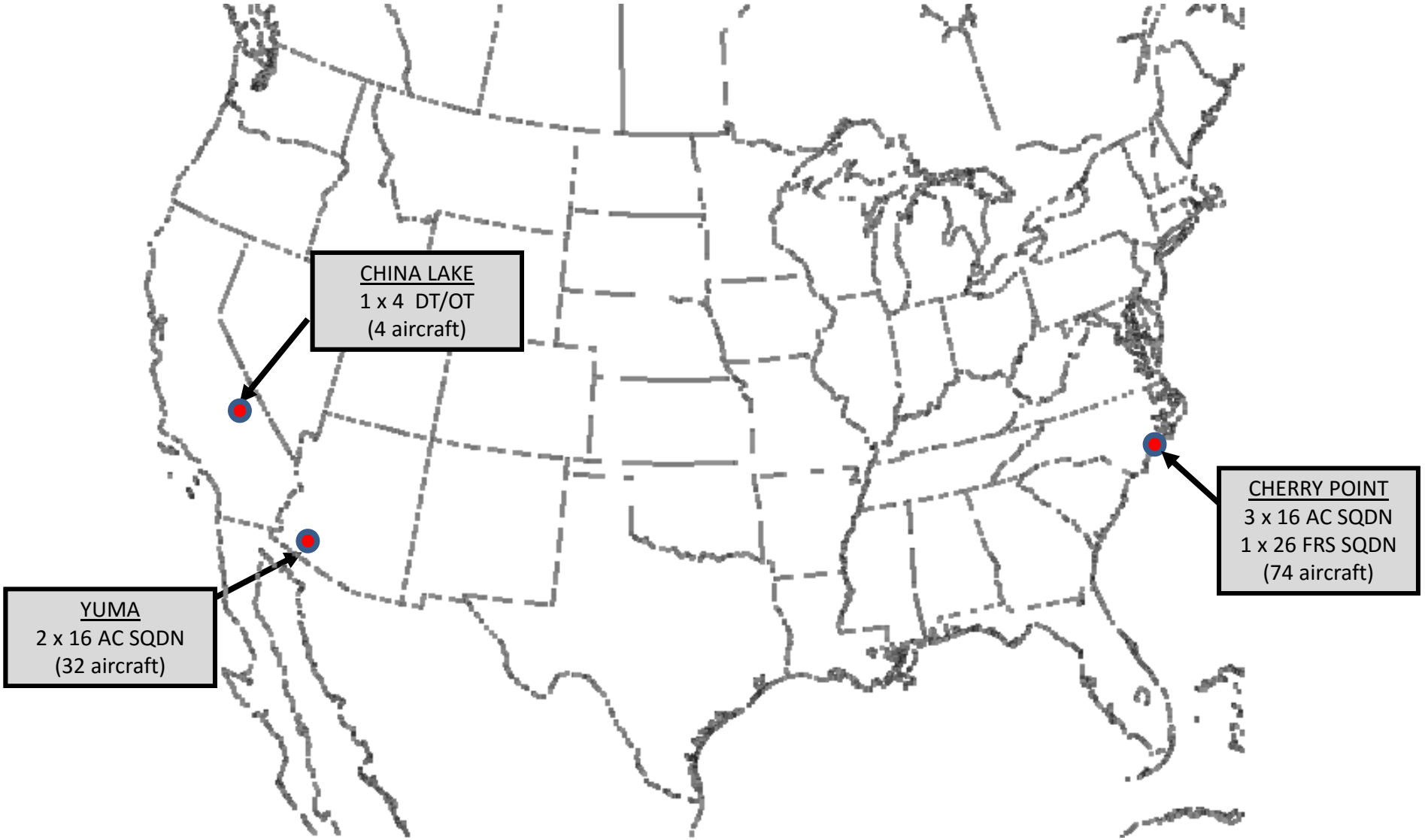
		FY18				FY19				FY20				FY21				FY22				FY23				FY24				FY25				FY26				FY27			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
MAG-13 YUMA																																									
VMA-214	16 AV-8B															B						V				F-35B Squadron															
VMA-311	16 AV-8B																			C						V				F-35C Squadron											
AV-8B Sim	2																					Sundown																			
MAG-14 CHERRY POINT																																									
VMA-223	16 AV-8B																					B				V				F-35B Squadron										
VMA-542	16 AV-8B																						B							V		F-35B Squadron								
VMA-231	16 AV-8B																																		B							
VMAT-203	13 AV-8B / 13 TAV-8B																					Training shifts to an FRD													Sundown						
AV-8B Sim	3																																				Sundown				
VX-31 CHINA LAKE																																									
VX-31	4 AV-8B																																				Sundown				

B= F-35B TRANSITION BEGINS

C= F-35C TRANSITION BEGINS AND FRS FLIGHT OPS MOVE TO VFA-125

V= FOC

AV-8B HARRIER (VMA) PLAN



AV-8B HARRIER (VMA) PLAN

INITIATIVES AND WAY AHEAD

The **AV-8B Harrier is the Marine Corps' only fixed-wing TACAIR on MEUs** during the transition to F-35B. As the 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)
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

H6.2 OFP

H6.2 will be released in FY18 and is the next major operational flight program (or OFP) update for AV-8B. This update fields initial LINK-16 capability which integrates Positive Position Location and Identification (PPLI). FAA compliant RNP/RNAV with non-precision GPS approach, and initial Mode 5 capability are also part of this OFP. Finally, a number of improvements will be incorporated and software deficiencies corrected to further increase reliability and combat capability. H6.2 involves hardware modifications and modernization, as well as the software.

H7.0 OFP

H7.0 is scheduled for release in FY20 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 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.

H7.0 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 MAGTF EW net extension. Wireless transmission of high definition video to an in-cockpit tablet is another capability that the program is attempting to incorporate into ATDL. LITENING ATDL is currently scheduled for initial fielding to the fleet concurrent with H7.0 in FY20.

AV-8B HARRIER (VMA) PLAN

UPGRADES

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

LETHALITY:

AIM-9X Block II – 2020
AIM-120C – 2020
Precision Stand Off Weapon – 2020

ELECTRONIC WARFARE :

Intrepid Tiger II V 1 Block X – 2021-22

INTEROPERABILITY :

Digitally aided CAS VMF terminals – 2017
LITENING Gen 4 Advanced Tactical Data Link – 2020
LINK-16 – 2018 PPLI initial capability /
2020 Full AV-8B Integration
SATCOM – 2022

RELIABILITY:

Digital Video Recorder – 2017

AV-8B HARRIER (VMA) PLAN

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

1) H6.2 integrated testing (Link-16 initial, LPOD COFPv3, multiple CDPs, RNP/RNAV)
2) H7.0 design and development (Link-16 Strike/Intercept, AIM9X, LPOD COFPv4 & ATDL, APKWS & IT2 CDPs)
3) Non-Block Development (APKWS Envelope Expansion Tanks 2&6, AIM120C5/7 Ground Vibration Test & Separation)
4) JMPS and Trainer Development Support (H6.2 – MPE 4.1, H7.0—MPE 5.0, Simulator)
5) Fleet Support (HarrierHelp, MAWTS-1 Support, Fleet Briefs, Pubs edits and updates)

EA-6B PROWLER AND AVIATION ELECTRONIC WARFARE PLAN

VALUE TO THE MAGTF

The Marine aviation approach to electromagnetic spectrum operations (EMSO) is a **distributed, platform-agnostic strategy**. Marine aviation is integrating EW systems and Intrepid Tiger II (IT II) payloads across aviation platforms to provide commanders with an organic and persistent airborne EW capability for every MAGTF, large and small.

This integration of manned and unmanned EW systems provides the MAGTF commander with EW capability where historically he had none.

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

- IT II has been integrated on the AV-8B, F/A-18A-D, and UH-1Y
- Since 2012 IT II has completed over 25 deployments.
- Throughout FY17 IT II was deployed in support of the 22nd, 11th, 24th, and 31st 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 .

The F-35 AN/ASQ-239 system provides comprehensive EW capabilities, including fully integrated radar warning, targeting support and self-protection, to detect and defeat surface and airborne threats.

EA-6B PROWLER AND AVIATION ELECTRONIC WARFARE PLAN

VMAQ-2's deactivation in FY19 will mark the end of the EA-6B's service in the Marine Corps, as well as its continuous employment as a joint tactical Airborne Electronic Attack (AEA) asset.

USN EA-18G expeditionary squadron capacity, which has replaced Marine Corps EA-6B squadron capacity, will continue to serve as the Department of Defense's sole joint tactical AEA asset.

CAPABILITIES

Aircraft Specifications
- Empty Weight: 34,000 pounds
- Max Gross Weight: 61,500 pounds
- Speed (Cruise/Max): 0.86 IMN with Stores

Configuration
- Weapons Stations: 5
- Offensive Systems: ICAP III ALQ-218 Receiver and ALQ-99 pods; USQ-113 Communications Jammer; AGM-88 HARM; LITENING Pod; ALE-43 Bulk Chaff Pod
- Network Systems: Multi-functional Info Distribution System (MIDS) with Link 16; Integrated Broadcast System (IBS)
- ASE: ALE-47

Notional Mission Profile
- OAS
  - Range/Time on Station (TOS)- 500 NM un-refueled, ~1+45 TOS
  - Loadout- (3) ALQ-99 pods, (2) drop tanks

ORGANIZATION

The Marine Corps currently has one operational EA-6B squadron, VMAQ-2, which will support joint AEA operational requirements through FY18. VMAQ-2 operates the Improved Capabilities (ICAP) III Block 7 version of the EA-6B Prowler.

MANPOWER

Sufficient inventory exists to meet the Prowler's manpower requirements through sundown. MOS production has ceased. HQMC Aviation is working with manpower process owners to identify pathways for lateral moves, transition opportunities or non-PMOS billets.

SUSTAINMENT

One operational squadron of six ICAP III aircraft.

SUNDOWN TIMELINE

The sundown of Marine Corps Prowlers began in May of 2016 with the deactivation of VMAQT-1, the EA-6B Fleet Replacement Squadron (FRS). VMAQ-1 was re-designated from an operational squadron to a FRS in June 2013.

VMAQ-4 deactivated in June of 2016. VMAQ-3 began deactivation in October 2017 and will complete deactivation in the summer of 2018. VMAQ-2 begins deactivation in October 2018 and will complete deactivation in FY19.

CURRENT FORCE PAA:
1 VMAQ SQDN 6xEA-6B

EA-6B PROWLER AND AVIATION ELECTRONIC WARFARE

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

		FY18				FY19				FY20			
		1	2	3	4	1	2	3	4	1	2	3	4
MAG-14 CHERRY POINT													
VMAQ-2	6 EA-6B									Sundown			
VMAQ-3	6 EA-6B					Sundown							
TTT 15E43	1							Sundown					
OF/NT 2F185	1							Sundown					
WST 2F188	1				Sundown								

NOTES:
VMAQ-3 BEGAN DEACTIVATION 1 OCT 2017; DEACTIVATION COMPLETE FY18.
VMAQ-2 BEGINS DEACTIVATION 1 OCT 2018; DEACTIVATION COMPLETE FY19.
TTT 15E43 DISPOSAL 2Q FY19.
OF/NT 2F185 DISPOSAL 2Q FY19.
WST 2F188 DISPOSAL 3Q FY18.

INITIATIVES AND WAY AHEAD

IT II BLOCK X COUNTER-RADAR ENGINEERING CHANGE PROPOSAL

IT II Block X will add a counter-radar ES and EA capability to the current IT II communications EW capability. The priority platform for IT II Block X integration is the MV-22B. The MV-22B and legacy TACAIR platforms are currently funded through the FYDP for Block X integration.

RQ-21 IT II INTEGRATION

The initial research and design for an IT II EW payload on the RQ-21 began in FY18; payload production is planned for FY21-23. This variant of IT II will provide an EW payload capable of communications ES and EA for the Irregular Warfare threat.

Integrating IT II on the RQ-21 will lay the foundation for further EW expansion within the VMUs as Marine aviation continues development of MAGTF Unmanned Expeditionary Capabilities.

MAGTF UNMANNED EXPEDITIONARY CAPABILITIES (MUX)

Future Marine aviation EW capabilities will also be provided by MUX.

In addition to providing persistent reconnaissance/ surveillance and communications, MUX will also provide a long range, persistent, penetrating, responsive, airborne EMSO capability.

F-5 (VMFT) PLAN

VALUE TO THE MAGTF

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

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 assigned to VMFT-401 at MCAS Yuma. The program is managed through PMA-226, along with the Navy's 34 F-5s.

The F-5 consistently meets its readiness goals. 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 F-35, VMFAT-501 pilot training requirements (PTR) will more than double to nearly 1600 required adversary sorties in FY19. Additionally, the Marine Corps will stand up its second FRS with VMFAT-502, while five AV-8B and three F/A-18 squadrons convert to the more demanding F-35B/C squadrons by FY22.

Annual fleet adversary requirements are expected to 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 of upper cockpit longerons, wings, horizontal stabilator pairs, and vertical stabilators that will enable the F-5 to achieve its 6000 (F-5F) / 9000 (F-5N) hour life. This extends the Department of the Navy's 44 F-5 airframes to 2025 and at least 12 aircraft to approximately 2028 in support of fleet training.

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 2018. Accordingly, the USMC suffers a nearly 7000-sortie capacity gap.

INITIATIVES/WAY AHEAD

A 2018 upgrade to the F-5 is a red-net data link solution that provides requisite SA through secure Commercial Off The Shelf (COTS) kneeboard tablet. Upgrading EA capabilities from level 2 to a higher level are in work by the PMA.

Expansion of the F-5 program will continue to be explored but no solutions are apparent. The long-term solution is dependent on the DoN adversary roadmap; near-term efforts are in work with 4th MAW and the Total Force Structure Division (TFSD) at CD&I. Efforts include a temporary or permanent footprint of aircraft on the East Coast.

These aircraft may come from commercial services or the reserve component. The intent is for them to source red air, JTAC frags, and MAGTF support in place of active component airframes.

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 our 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 increase in terminal attack controllers in the GCE TO&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 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.

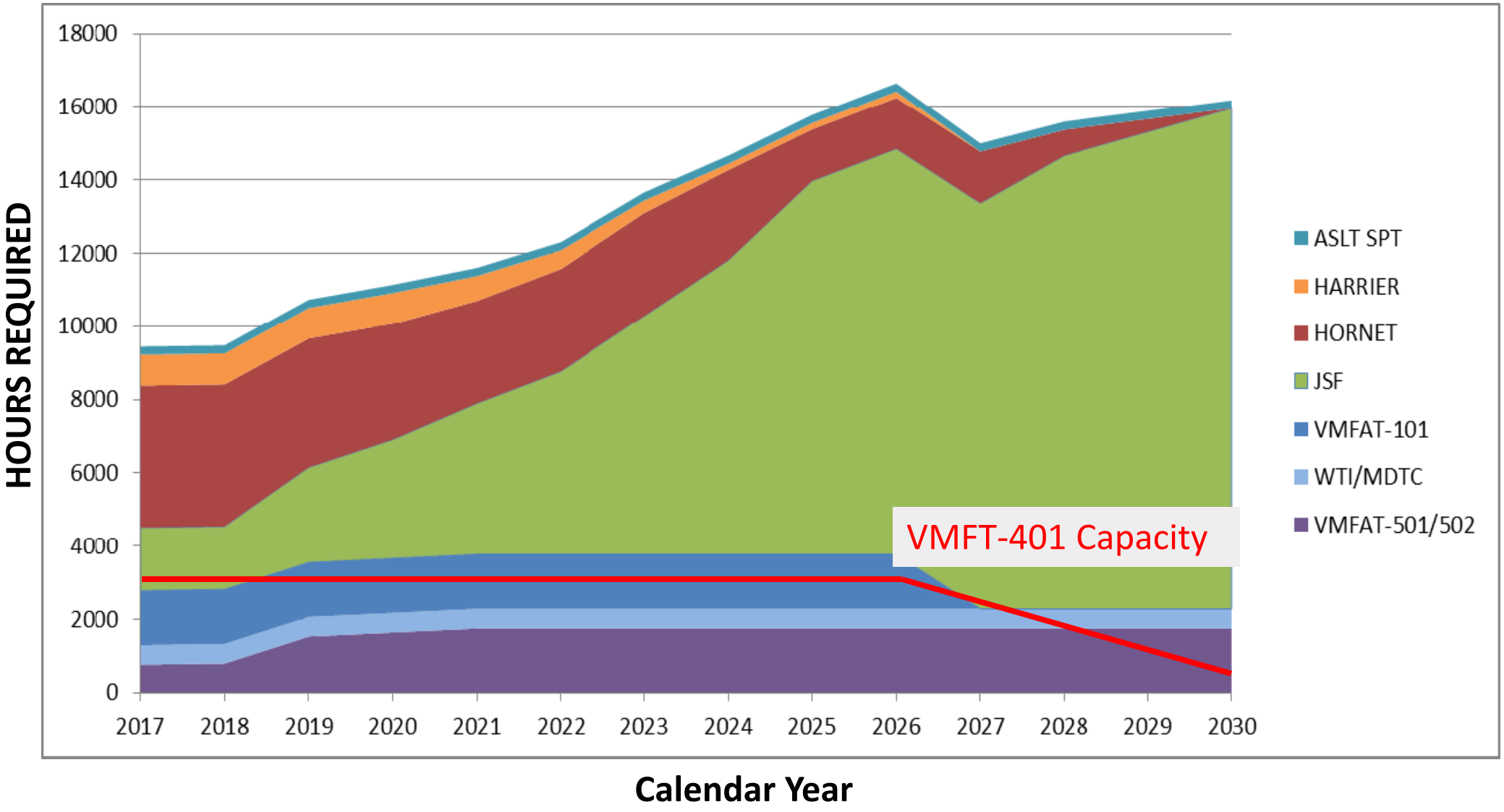
The Marine Corps F-5 fleet has a service life plan that begins divestiture of current platforms in 2026. Marine aviation is working with the Navy to determine future Department of the Navy (DoN) adversary requirements and to conduct analysis on future government and vendor operated solutions. The DoN adversary solution will require an increase in adversary capacity 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 permanent resources at MCAS Beaufort. 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 MAGTF requirements for adversary against F-35 and F/A-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.

USMC Adversary (Air-to-Air) Requirements



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 operation reach of the MAGTF** and, for detachments equipped with Harvest HAWK, provide organic ISR and CAS.

MISSION STATEMENT

The mission of VMGR is to support the MAGTF commander by providing air-to-air refueling, assault support, close air support (CAS) and multi-sensor imagery reconnaissance (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
- Maximum 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
- 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 Harvest HAWK kits: 5 modified aircraft in 2d MAW, and 5 modified aircraft in 3d MAW.

The mission kit configures the KC-130J aircraft into a platform capable of performing persistent targeting ISR 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. Surge capability exists within a VMGR to provide an additional deployable detachments in support of simultaneous contingencies; however the squadron is not structured to sustain the additional detachment on an enduring basis. Additionally, detachment size is 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 an FRD at 2nd MAW. MATSS provides Weapons Systems Trainers (WSTs); Cockpit Procedures Trainers (CPTs); Fuselage Trainers (FuTs) and Observer Trainer (OTAs).

The Marine Corps has delivered 70% of the required KC-130J aircraft and transition is complete for the active component. Total procurement is planned to be 79 KC-130Js with the last delivery scheduled for 2031.

69 aircraft will be designated as Primary Mission Aircraft Inventory (PMAI) and 10 designated as Backup Aircraft Inventory (BAI), with the following breakdown:

1) 3 active squadrons x 15 PMAI / 2 BAI

2) 2 reserve squadrons x 12 PMAI / 2 BAI

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 the 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 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.

CURRENT FORCE:

3 AC SQDN X 15 KC-130J

1 RC SQDN X 7 KC-130J

1 RC SQDN X 12 KC-130T

KC-130J/T HERCULES (VMGR) PLAN

FUTURE FORCE (FY2026):

3 AC SQDN X 15 KC-130J

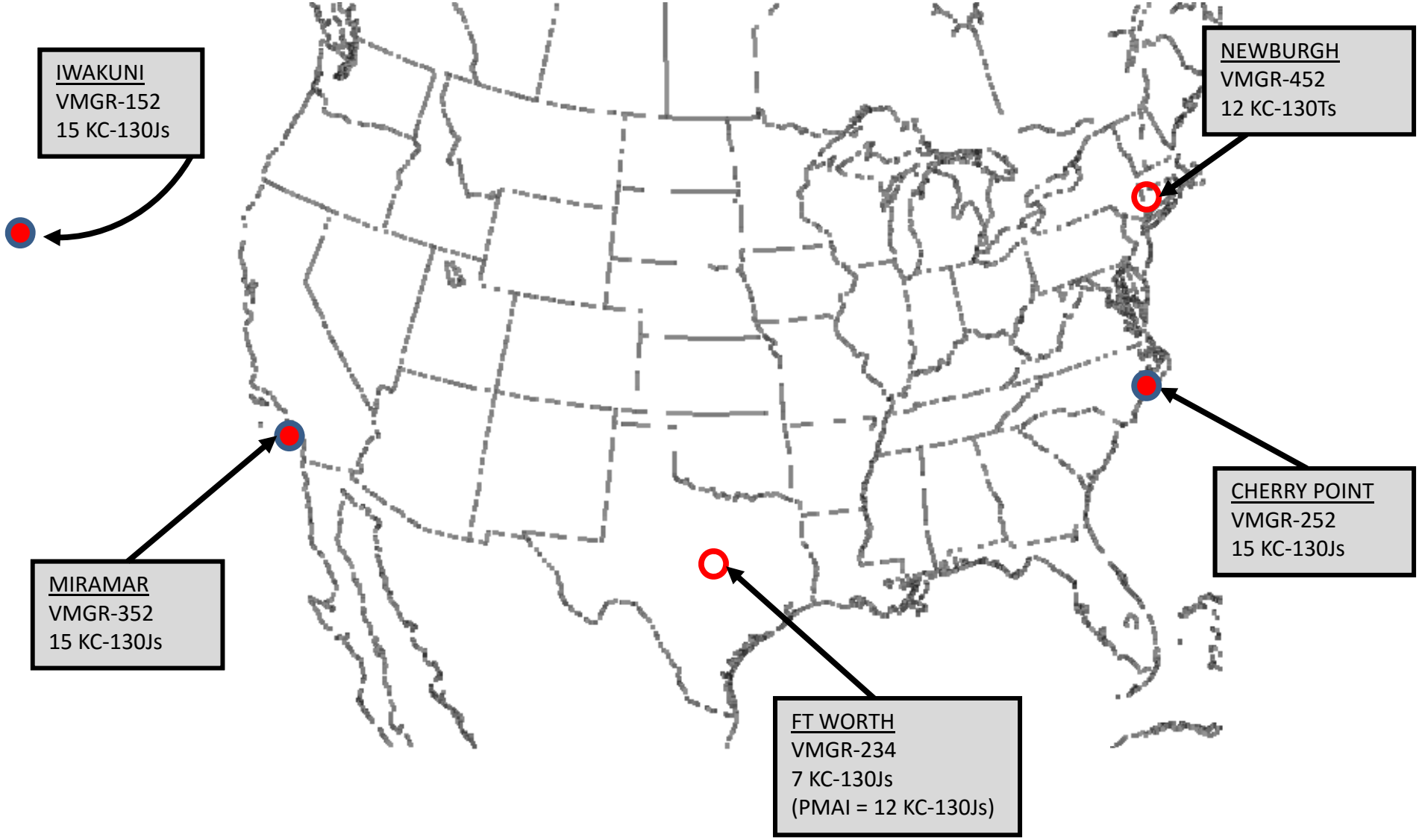
2 RC SQDN X 12 KC-130J

		FY18				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	1	2	3	4
MAG-11 / MIRAMAR, CA																																									
VMGR-352	15 KC-130J																																								
3MAW MATSS	WST	Note 3											Note 4,8																												
	CPT	Note 6,10																																							
	FuT	Note 1,2,10																																							
	OTA	Note 1,6,10																																							
MAG-12 / IWAKUNI, JA																																									
VMGR-152	15 KC-130J																																								
1MAW MATSS	WST																			Note 4,8																				
	CPT	Note 6,12																																							
	FuT	Note 1,2,12																																							
	OTA	Note 1,6,12																																							
MAG-14 / CHERRY POINT, NC																																									
VMGR-252	15 KC-130J																																								
2MAW MATSS	WST	Note 3						Note 4,8																																	
	CPT																																								
	FuT	Note 1,5																																							
	OTA	Note 1,5																																							
MAG-41 (RESERVE COMPONENT) / FORT WORTH, TX																																									
VMGR-234	7 KC-130J																									12 KC-130J														
4MAW MATSS	WST	Note 6,7,11													Note 4,8																										
	CPT	Note 6,11																																							
	FuT	Note 1,11																																							
	OTA	Note 1,11																																							
MAG-49 (RESERVE COMPONENT) / NEWBURGH, NY																																									
VMGR-452	12 KC-130T						J		V																												12 KC-130J			
4MAW MATSS	WST					Note 2,9																																			
	CPT					Note 2,9																																			
	FuT					Note 1,2,9																																			
	OTA					Note 1,2,9																																			

NOTES:

1) Trainer can perform in Standalone of connected to WST for full CRM training
2) MILCON required to support this trainer
3) BU 6.5-3/LAIRCM modification
4) Technology refresh
5) This trainer will go into FuT building (P-229)
6) This trainer will be in temp location until FuT building is complete
7) Ready for training Oct 31 2017
8) Reconfigurable BU6.5-3 to BU8.1
9) Device currently unfunded
10) Trainer will go into new building (P-200)
11) Trainer will go into new building (P-077)
12) Trainer will go into new building (P-1006)

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, backup aircraft are not expected to deliver until FY26.

The KC-130J is a maturing platform that has completed its transition in the active component and will reach FOC in the reserves in FY26. It continues to meet all readiness and 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 are forcing 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 this fiscal year, CONUS events will begin 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 FY26. BAI procurement is deferred until the reserve component reaches FOC and will complete delivery in FY31.

Legacy KC-130T aircraft will continue operation in 4th MAW until VMGR-452 reaches KC-130J IOC - planned for FY20. 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 2020. 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 7.0/8.1 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 2017, 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 planned for FY20. The VMGR fleet utilization of the new modifications to the Harvest HAWK aircraft is anticipated in FY19.

Additional modifications associated with OWS430 are ongoing with the nine remaining installs scheduled to start in 2020. 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 V 1 US

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 FY17.

KC-130J/T HERCULES (VMGR) PLAN

INTEROPERABILITY

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

Block 7.0/8.1 is in developmental test and operational test is scheduled for FY19 with fleet install beginning in FY20.

Software Reprogrammable Payload (SRP), Increment 2 will be available for test in FY20 with fleet install beginning in FY21.

DEVELOPMENTAL TEST

1) The trial-kit installation and developmental test for Block 7.0/8.1 is 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 will enter test in FY18.

OPERATIONAL TEST AND EVALUATION

Harvest HAWK and DoN LAIRCM conducted OT during FY17. Modification and test of OWS430 is expected in FY18.

UH-1/AH-1 (HMLA) PLAN

VALUE TO THE MAGTF

H-1s provide attack and utility capability and provide the MAGTF with fires, lift, escort, assault support, close air support, control of aircraft and missiles and command and control capability. The H-1 can fly from ship or shore, day or night, in support of MAGTF tasking and the ground scheme of maneuver.

MISSION STATEMENT

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

CAPABILITIES

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

The AH-1Z Viper replaces the AH-1W, while the UH-1Y Venom has fully replaced the UH-1N. The Viper is the next generation of attack aircraft; the UH-1Y is the next generation utility aircraft. Speed, range, and payload for both airframes have been increased significantly, while decreasing maintenance workloads, training timelines, and total ownership cost. The advanced cockpit, common to both AH-1Z and UH-1Y reduces operator workload, improves SA and provides growth potential for future weapons and joint digital interoperability enhancements.

AH-1W

The AH-1W SuperCobra is a combat-proven force multiplier for the MAGTF providing close air support, strike coordination and reconnaissance, armed reconnaissance, escort, forward air controller airborne, and air interdiction.

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: Four
- Armament: 20mm cannon; 2.75 rockets (to include APKWS); TOW, HELLFIRE with multiple warhead configurations; AIM-9
- Sensors: Night Targeting System Upgrade, FLIR, TV
- Networked Systems: Tactical Video Date Link (90 aircraft)
- ASE:AAR-47, ALE-47 Dual Dispenser Pods, ALQ-144, and APR-39

Notional Mission Profile

- OAS
  - Range/Time on Station (TOS)- 50nm transit, 0+30 TOS, 50nm RTB
  - Loadout- (8) HELLFIRE, (38) 2.75” rockets, (500) 20mm

UH-1/AH-1 (HMLA) PLAN

AH-1Z

The cockpit systems assimilate planning, communications, navigation, digital fire control, day/night targeting, and weapons systems in mirror-imaged crew stations.

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: Six
- Armament: 20mm cannon, 2.75 rockets, HELLFIRE with multiple warhead configurations and AIM-9 Sidewinder
- Sensors: TSS
- Networked Systems: ANW2, DI FMV
- ASE: AAR-47 B(V)2, ALE-47, and APR-39

Notional Mission Profile
- OAS
  - Range/Time on Station- 50nm transit, 1+00 TOS, 50nm RTB
  - Loadout- (8) HELLFIRE, (38) 2.75” rockets, (500) 20mm

UH-1Y

The cockpit systems assimilate planning, communications, navigation, digital fire control, day/night targeting, and weapons systems in mirror-imaged crew stations.

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: Two
- Armament: 2.75-inch rockets, fixed forward or crew served 7.62mm/GAU-17A gun and or crew served M240D/GAU-16/GAU-21 machine guns, APKWS
- Sensors: Brite Star Block II, Intrepid Tiger II
- Networked Systems: ANW2, DI FMV
- ASE: AAR-47, ALE-47, and APR-39

Notional Mission Profile
- OAS
  - Range/Time on Station- With utility payload, eight combat-loaded Marines (240 pounds each), two fastropes, two IDAS mounts with weapons :
    119 nm transit, 0+20 TOS, RTB with 20 minute fuel reserve

UH-1/AH-1 (HMLA) PLAN

ORGANIZATION

Marine Corps HMLA squadrons are **organized to break into detachments** of five AH-1Z or AH-1W and four UH-1Y.

The Marine Corps will procure a total of 349 H-1's (189 AH-1Z's and 160 UH-1Y's) in the following squadron bed down:

1) 7 active squadrons x 15 AH-1Z and 12 UH-1Y
2) 1 full reserve squadron x 15 AH-1Z and 12 UH-1Y
3) 1 reserve squadron minus x 12 AH-1Z and 9 UH-1Y
4) 1 fleet replacement squadron x 15 AH-1W, 15 AH-1Z and 12 UH-1Y

The Marine Corps is 100% complete with the UH-1Y transition and 40% complete with the AH-1Z transition. There are seven squadrons in the active fleet, one FRS and two reserve squadrons. The UDP in Okinawa is complete with the Z transition, leaving the east coast and the reserve component to complete.

- HMLA-775 FOC 2017
- Yuma SAR ceases operations in 2018: transition to contract SAR
- IRR Complete
- MEU deployment on AH-1Z
- UDP in Okinawa and 31 MEU transitioned to AH-1Z

FRS

HMLAT-303 will no longer produce AH-1W replacement aircrew after FY17. By eliminating the AH-1W training requirement, the FRS will gain additional capacity in AH-1Z initial accession throughput and pilot conversion. The reserves will assume the AH-1W model manager responsibilities and refresher training requirements.

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 persist as a result of policies used during the 202K downsizing.

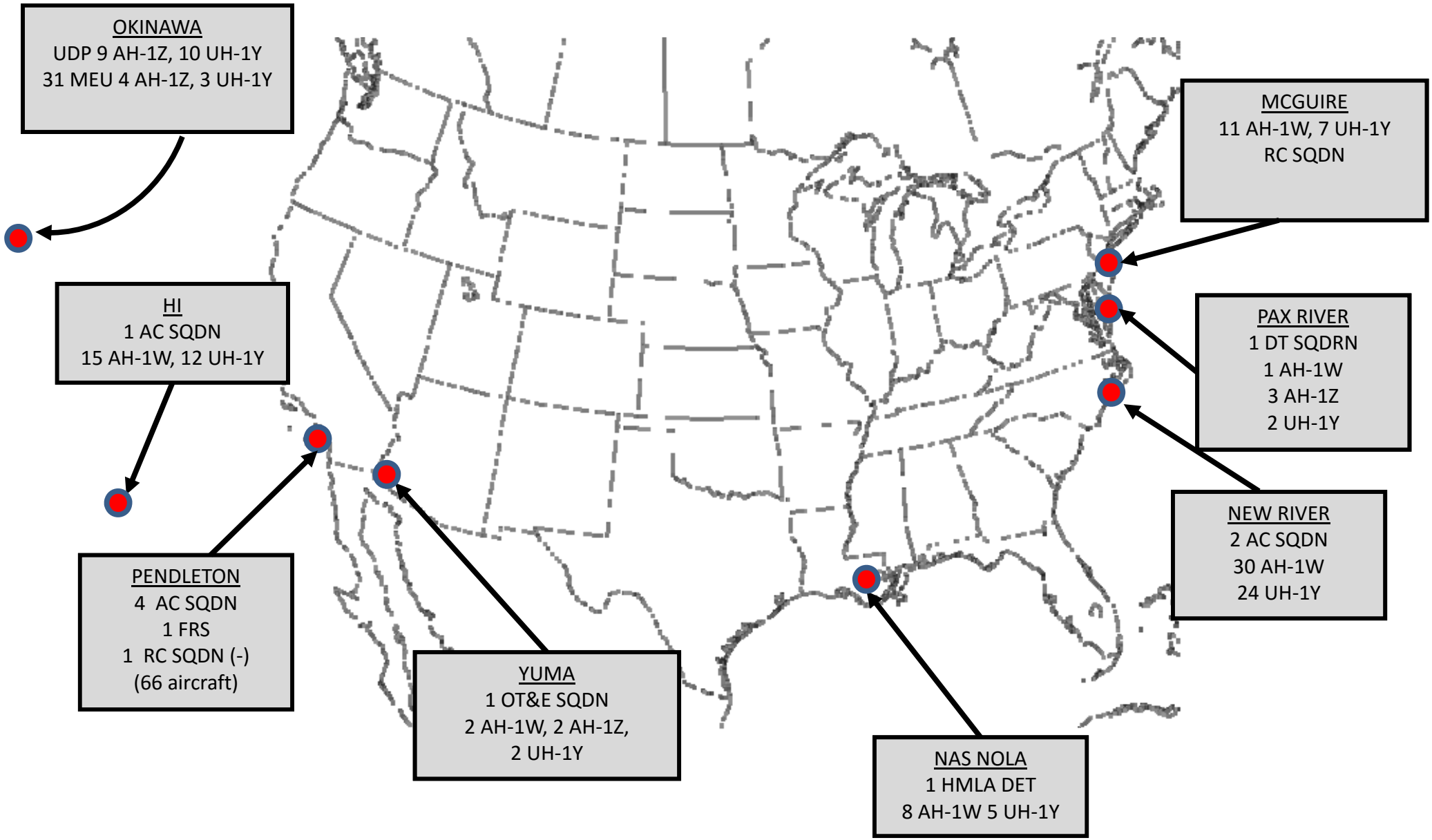
HQMC Aviation ensures the force structure requirement is accurate in order to provide the correct demand signal to planners and assignments monitors at Manpower and Reserve Affairs.

The Marine Corps' Total Force Structure Management System (TFSMS) and unit Tables of Organization reflect the 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-24 and 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.

HQMC Aviation anticipates growth in foreign military sales, and the 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.

UH-1/AH-1 (HMLA) PLAN



CURRENT FORCE PAA:
4 AC HMLA SQDN 15xAH-1Z, 12xUH-1Y
3 AC HMLA SQDN 15xAH-1W, 12XUH-1Y
1 RC HMLA SQDN 15xAH-1W, 12xUH-1Y
1 RC HMLA SQDN (-) 11xAH-1W, 9xUH-1Y
1 FRS 10xAH-1W, 13xAH-1Z, 17xUH-1Y

FORCE GOAL PAA:
7 AC HMLA SQDN 15 AH-1Z, 12x UH-1Y
1 RC HMLA SQDN 15AH-1Z, 12xUH-1Y
1 RC HMLA SQDN (-) 11xAH-1Z, 9xUH-1Y
1 FRS SQDN 15xAH-1Z, 12xUH-1Y

UH-1/AH-1 (HMLA) PLAN

		FY18				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	1	2	3	4
MAG-24 KANEOHE BAY																																									
HMLA-367	15 AH-1/12 UH-1			V																																				
AH-1W APT	1													Sundown																											
UH-1Y FTD	1																																								
AH-1Z FTD	1																																								
MAG-29 NEW RIVER																																									
HMLA-167	15 AH-1/12 UH-1					Z		V																																
HMLA-269	15 AH-1/12 UH-1						Z		V																																
AH-1W WST	1													Sundown																											
UH-1Y FTD	2																																								
AH-1Z FTD	2 1Q FY19					2																																			
MAG-39 CAMP PENDLETON																																									
HMLAT-303	15 AH-1Z/12 UH-1Y																																								
HMLA-169	15 AH-1Z/12 UH-1Y																																								
HMLA-267	15 AH-1Z/12 UH-1Y																																								
HMLA-369	15 AH-1Z/12 UH-1Y																																								
HMLA-469	15 AH-1Z/12 UH-1Y																																								
AH-1W WST	1													Sundown																											
AH-1Z Sim	4																																								
UH-1Y Sim	4																																								
MAG-49 RESERVE COMPONENT																																									
HMLA-773 (-) McGuire	11 AH-1W/7 UH-1Y														Z		V																								
HMLA-773 DET NOLA	8AH-1W/5 UH-1Y														Z		V																								
AH-1W APT	1													Sundown																											
UH-1Y FTD	1																																								
AH-1Z FTD	1																																								
MAG-41 RESERVE COMPONENT CAMP PENDLETON																																									
HMLA-775	11 AH-1/9 UH-1										Z		V																												
YUMA SAR	4 HH-1N					Contract SAR																																			

NOTES:
HMLA-775 HQ AT CAMP PENDLETON.
MRF-D REQUIRMENTS FILLED BY HMLA-367 STARTED IN FY-15 WITH GUAM DETS SOURCED WITHIN MFP SCHEDULED TO BEGIN FY22.
MAG-39 HISTORICALLY SUPPORTS FOUR MEUS AND UDP.
MAG-29 HISTORICALLY SUPPORTS THREE MEUS.
HMLA POR IS 349 (160 Y and 189 Z) PMAI IS 125(Y) / 155 (Z) TOAI IS 349

Z = ZULU TRANSITION BEGINS

V = TRANSITION COMPLETE

UH-1/AH-1 (HMLA) PLAN

RESERVE INTEGRATION

Reserve transition to the AH-1Z remains programmed for FY20. With HMLA-773(-) consolidated from three sites to two, the focus now turns to HMLA-775(-) which reactivated aboard MCAS Camp Pendleton in FY17. This added strategic depth to reserve aviation, and preserved reserve HMLA operational capacity in support of the total force.

INITIATIVES AND WAY AHEAD

The future readiness plan is encapsulated by the Configuration Management initiative. This effort will bring the fleet to a single hardware and software configuration, then start improvements leveraging technologies from multiple sources to include future vertical lift (FVL) to increase capability and ensure relevance and improved readiness at a lower cost for decades. Additionally, the program will look to increase capability under the initiatives of digital interoperability, all weather navigation and operation, and stores and extended range, as well as tie it all together utilizing smart design in a future interface optimization effort.

Readiness and Configuration Management
Electrical and structural Improvement
Drive Train/Dynamic Component Improvements
Tech Refresh Mission Computer (TRMC) Retrofit
APR-39(D)V2 retrofit
ANS/ADTS Retrofit

Digital Interoperability
DI-FMV
Link-16
BLOS Voice/Data

All Weather Navigation and Operation
EGI upgrade
IFF Improvement

Stores and Extended Range
Y Structural Upgrade
AH-1Z Intrepid Tiger (IT2V3)

Interface Optimization
Smart/Digital Displays
Modular Software

UH-1/AH-1 (HMLA) PLAN

UPGRADES

Electrical Improvements 2017-2027

Structural Improvements 2017-2027

Drive Train/Dynamic Component Improvements 2017-2027

Tech Refresh Mission Computer (TRMC) 2017-20xx

ASE/SURVIVABILITY

APR-39(D)V2 retrofit

ANS/ADTS Retrofit

Intrepid Tiger II V 1 Block X FY19-21

DAIRCM

DI-FMV

WEAPONS

JAGM 2019-2020

AIM-9X

INTEROPERABILITY

DI-FMV

Link-16

Tactical Secure Voice

ALL WEATHER NAVIGATION AND OPERATION:

EGI Upgrade

RNP/RNAV

TAWS II Integration

IFF Improvement

STORES AND EXTENDED RANGE:

Y Structural Upgrade

Intrepid Tiger

RELIABILITY:

Electrical Improvements 2017-2027

Structural Improvements 2017-2027

Drive Train/Dynamic Component Improvements 2017-2027

Tech Refresh Mission Computer (TRMC) 2017-20xx

UH-1/AH-1 (HMLA) PLAN

DEVELOPMENTAL TEST

1) Fleet sustainment – Vehicle Management System (VMS) and JVX Application System Software (JASS) software drops
2) SCS 8.2 (APR 39D(V)2, JAGM, corrections)
3) First JAGM shots on targets
4) DI-FMV spiral 3
5) Pakistan FMS support testing
6) DAIRCM
7) Envelope expansion for shipboard operations

OPERATIONAL TEST AND EVALUATION

1) Brite Star II Laser Spot Tracker
2) TRMC Software
3) DI-FMV Developmental and Cyber Security – July-Sept 2017
4) Intrepid Tiger Operational Test- Nov 2017
5) DAIRCM Quick Reaction Assessment – Aug 2018

OPERATIONAL TEST AND EVALUATION

1) APR-39Dv2 (test in late FY19)

2) SCS 8.2 (test in late FY19)

3) JAGM (TBD)

UH-1/AH-1 (HMLA) PLAN

FUTURE VERTICAL LIFT

While developing tactics and weapons systems for the future threat and battlespace there is a need to develop aircraft that complement F-35 Joint Strike Fighter (JSF) and MV-22B. While the H-1 series aircraft provides exceptional protection and fires to support MV-22 operations in the terminal objective area, both the UH-1Y and AH-1Z lack range and speed to perform enroute attached escort for the Osprey. This is especially challenging from a seabase in a higher threat environment. While MAGTF fixed-wing aircraft can perform attached escort, it is preferable for them operate in a detached escort role, clearing and killing at depth in support of the assault package. A joint effort called Future Vertical Lift (FVL) will provide revolutionary rotorcraft capability.

FVL is a family of systems (FoS) incorporating advanced aerodynamic capabilities which will redefine the operating concepts for the next generation of vertical take-off and landing (VTOL) aircraft. FVL is a plan to replace all DoD helicopters with next-generation rotorcraft that will meet USMC, SOCOM and USA rotorcraft requirements beginning in the mid-2030s. However widespread it eventually becomes, the FVL FoS will offer revolutionary capability over current VTOL aircraft fundamentally altering historic metrics for land force mobility, responsiveness, sustainability, readiness, and lethality. FVL has the potential to redefine distances in the operational maneuver space.

The FVL FoS initiative addresses future VTOL requirements by analyzing five capability sets ranging from light reconnaissance to heavy lift. Capability Set 3 (FVL CS 3) will be developed first, and will replace Army H-60s as well as Marine Corps H-1 attack and utility aircraft. Throughout the FoS there is potential for aircraft that are designed from conception for optimal manning, and for manned – unmanned teaming (MUM-T). Furthermore, FVL is pursuing common mission system architecture for all the capability sets to enable interoperability throughout the FoS.

The Marine Corps' driving requirement is tiltrotor escort in tomorrow's battlespace during distributed expeditionary operations from the sea. Speed, maneuver envelope, all-weather capability, and survivability will facilitate full integration into the MAGTF. To meet these goals the Marine Corps FVL CS 3 aircraft will have to operate above legacy rotary wing aircraft speeds with a full payload, to include having a high enough dash speed to enable it to sprint ahead of the Osprey to address pop-up threats in all but the most extreme weather conditions.

Additionally, FVL aircraft will require a comparable mission radius and loiter time to match MV-22, time on station to support distributed ACE operations as well as G-force limitations and service ceilings higher than legacy rotary wing airframes.

Amphibious operations and shipboard compatibility mean that air vehicle size will be another key attribute. The aircraft needs to remain close to the H-1 folded spotting size, have no landing spot restrictions on LHD/A, LPD-17, and LSD equivalent, and have minimal landing limitations.

The Marine Corps' Analysis of Alternatives (AoA) began in fiscal year 2017. The data generated from this event seeks to lay the ground work needed to develop an aircraft able to more than cover down on both the UH-1Y and AH-1Z and broader ACE mission sets.

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 enabled heavy lift assault support operations across the globe. This ship-to-shore vertical connecter routinely transports loads in excess of four and 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 have made it an indispensable 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. The King Stallion is currently executing developmental test and in April 2017 received authorization to proceed to Low Rate Initial Production. The physical foot print of the CH-53K is equivalent to that of the CH-53E while its logistical footprint has been reduced.

Most notable is the King Stallion's ability to maintain its increased performance margins in a degraded aeronautical environment (e.g. High-3000' / Hot-95°F / Heavy- 13.5 Tons out to 110 NM).

The CH-53K's new cabin is wider than that of the CH-53E and can now internal a HMMMV as well as being compatible with the large TRANSCOM 463L pallets. The new triple hook external cargo system enables disbursing three different loads at three different locations while executing one sortie.

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 than its predecessor. The increased capabilities that the CH-53K brings to the MAGTF coupled with its increased reliability and ease of maintenance will set a new standard for vertical heavy lift.

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.

CAPABILITIES: CH-53K

The CH-53K King Stallion is currently in Developmental Test and will **replace the CH-53E Super Stallion starting in December 2019.** The King Stallion is the sea-based, heavy lift, long range solution for the vertical MAGTF. Most notably is its ability to maintain increased performance margins in a degraded aeronautical environment. 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 than its predecessor. The increased capabilities that the CH-53K brings to the MAGTF coupled with its increased 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 have 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

Mission Profile

- Range/Payload/Conditions: 110nm, 9,654 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 145 aircraft is approximately 51 aircraft deficient of the program's 196 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 back to 16-aircraft squadrons. This will be enabled by the fielding of new CH-53Ks and the re-capitalization of CH-53E inventory from transitioning squadrons. Of note, the 200 aircraft program of record is 20 aircraft short of the 220 requirement (placing a 20 aircraft risk in attrition) due to fiscal constraints.

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

- 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 with the IOC declaration of the HMH-366 detachment at the end of calendar year 2019. It will take approximately four years for HMH-366 to complete its CH-53K transition (subsequent squadrons are planned for 18-month transitions.) 2nd MAW will complete the CH-53K transition in FY26 followed by 1st MAW in FY27 and 3d MAW in FY29.

In late FY23, HMH-366 will chop the first CH-53K MEU detachment and will set the initial conditions for east coast sustained CH-53K MEUs. The CH-53K program achieved Milestone C, and Developmental Test has moved from Juniper, Florida to Patuxent River. The first operational deployment for the CH-53K has shifted from FY23 to FY24 due to a decrease in initial aircraft procurement.

The Okinawa Unit Deployment Program UDP and its associated MEU will transition to CH-53K by FY26 and west coast MEUs by late FY28. CH-53Es from transitioning squadrons will be redistributed within the fleet with priority going to 3d MAW, permitting a return to a 16 aircraft PMAA. This repopulation will enable 1.0 squadrons and the ability to support .5 squadron minus and two separate .25 detachments simultaneously.

During the CH-53K transition, CH-53E/K personnel will be segregated to the max extent possible. **Once a Marine transitions to the CH-53K, he/she will permanently cease operations on the CH-53E**. The only exception to this policy will be VMX-1. For a very limited duration, VMX-1 pilots and maintainers will be dual-series qualified until VMX-1 divests of CH-53E operational test responsibilities (approximately FY22).

CH-53E AND K (HMH) PLAN

FRS

The CH-53K Transition Task Force (TTF) identified lessons learned and best practices from the V-22 transition. During the V-22 transition, the last HMM scheduled for transition re-designated as an HMMT and assumed the CH-46 FRS. These responsibilities were in effect until the demand signal for initial pilot training ceased. The squadron redesignated back to an HMM and executed the final tactical deployment of the CH-46 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 (approximately FY22).** To enable this action the last HMH scheduled to transition will assume the CH-53E FRS. Prior to redesignation, 3d MAW's remaining three tactical squadrons will return PMAA to offset this action. These actions will enable a flexible CH-53K FRS with the ability to quickly increase output with changes in demand signal. The CH-53E FRS will continue to sustain legacy production while not decrementing tactical capability in 3MAW.

The CH-53K Transition Policy Letter dictates that three units (HMH-366 Detachment Bravo, VMX-1 CH-53 Detachment and HMHT-302 KILO) will execute early stages of the transition in HMHT-302 spaces.

HMH-466 will re-designate as HMHT-466 in FY21 in order to start to assume CH-53E FRS duties.

HMHT-302 will divest of CH-53Es in FY22.

MANPOWER

The status of TMS-specific MOSs in the Marine heavy helicopter community continues to be healthy. However, as with the rest of Marine aviation, 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 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 establishes the skill designator of 7511 for CH-53K qualified pilots and 6053 for enlisted maintenance personnel and aircrew. In October 2017, 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.

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 FY24, the reserve component will re-activate HMH-769 at MCAS Miramar. 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 HMHT-466 re-designates back to HMH-466. Numerous times during the CH-53K transition these two reserve squadrons will provide operational relief to the active component executing transition.

Marine reserve integration of the CH-53K begins in FY19, when HMH-772 (-) will return to its full complement of CH-53E aircraft, and will eventually transition to the CH-53K in FY29.

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

CH-53E AND K (HMH) PLAN

INITIATIVES AND WAY AHEAD

On the five year horizon for the CH-53 community is:

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 and subsequent initial transition of the first tactical squadron and FRS.
4) Complete Reset of the entire CH-53E fleet of aircraft.
5) Software Reprogrammable Payload (SRP) with LINK 16.
6) Initial return of 16 aircraft squadrons (PMAA).

UPGRADES

Mode V IFF FY20

Embedded SATCOM FY19

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

APX-123 for ADSB-out FAA mandate FY20

DVE Phases II and III

ASE/SURVIVABILITY :

Hostile Fire Indication (HFI)

Advanced Threat Warner/Missile Warner/Laser Warner

Integrated Aircraft Survivability Equipment (ASE)

INTEROPERABILITY :

Software Reprogrammable Payload (SRP) radio replacement

LINK 16

RELIABILITY:

419 Engine Upgrade FY20

Prognostic/Diagnostic Based Maintenance FY18

Engine Nacelles FY21

Kapton Wiring II & III Replacement FY18

CH-53E AND K (HMH) PLAN

CURRENT FORCE:
8 AC SQDN x 12 CH-53E (1)
1 RC SQDN x 6 CH-53E (2)
1 FRS SQDN x 10 CH-53E / 2MH-53E (3,4)

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

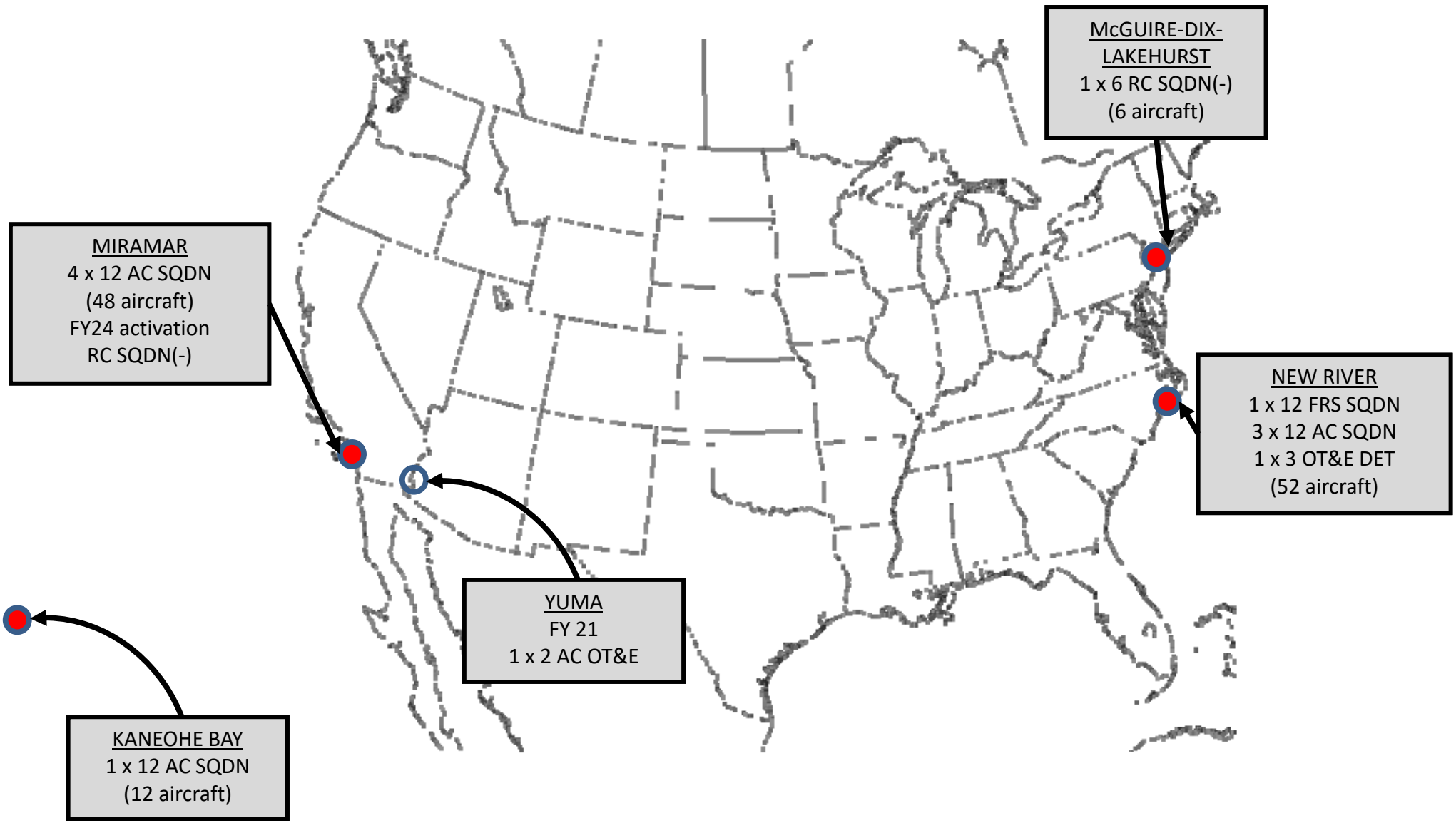
		FY18				FY19				FY20				FY21				FY22				FY23				FY24				FY22				FY25				FY26				FY27				FY28			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
MAG-16 Miramar																																																
HMH-361	12 CH-53E																	16 CH-53E																				K			V							
HMH-462	12 CH-53E																	16 CH-53E																								K			V			
HMH-465	12 CH-53E																	16 CH-53E																										K					
HMH / HMHT-466	12 CH-53E													FRS								16 CH-53E																				HMH-466								
3MAW MATSS	1 CH-53E WST																																															
	1 CH-53E APT																																															
	3 CH-53K CFTD																																	1				2			3								
MAG-24 Kaneohe Bay																																																
HMH-463	12 CH-53E																	16 CH-53E																								K			V			
1MAW MATSS	1 CH-53E CFTD																																									Sundown							
	1 CH-53K CFTD																									1																							
MAG-29 New River																																																
HMHT-302	12 CH-53E									K																																						
	2 MH-53E	2 MH-53E																																														
HMH-366	12 CH-53E									K																V																						
HMH-461	12 CH-53E																	16 CH-53E								K																		V				
HMH-464	12 CH-53E																	16 CH-53E																				K			V							
VMX-1 (H-53 DET) (6)	3 CH-53E		K										V																																			
2MAW MATSS	1 CH-53E WST																																															
	1 CH-53E APT																																															
	3 CH-53K CFTD		1								2			3																																		
	2 CH-53K FTD																		1				2																										
MAG-41 Miramar																																																
HMH-769 (-) (5)	8 CH-53E																								A																							
MAG-49 Joint Base McGuire-Dix-Lakehurst																																															
HMH-772 (-)	6 CH-53E																																															
4MAW MATSS	1 CH-53E FTD																																															
	CFTD																																															

A = ACTIVATE K = ENTERS CH-53K TRANSITION V = FOC TOTAL CH-53E INVENTORY = 145 CH-53K POR = 200 (220 REQ)

NOTES:

1) PRIMARY MISSION AIRCRAFT INVENTORY (PMAI) OF 12 A/C PER SQUADRON IS DUE TO INVENTORY SHORTFALLS, WHICH DO NOT SUPPORT PRIMARY MISSION AIRCRAFT AUTHORIZATION (PMAA) OF 16 A/C SQUADRONS. ONCE CH-53K TRANSITION BEGINS, CH-53E AIRCRAFT WILL BE CAPITALIZED FROM TRANSITIONING SQUADRONS TO ENABLE THE RETURN TO 16 A/C SQUADRONS.
2) PMAI OF 6 A/C PER SQUADRON UNTIL TOTAL INVENTORY SUPPORTS 8 A/C SQUADRON FACILITATED BY CH-53K TRANSITIONING SQUADRONS.
3) HMHT-302 WILL BECOME A DUAL T/M/S (CH-53E/CH-53K) UNTIL FY22 WHEN IT BECOMES STRICTLY A CH-53K FRS. HOWEVER PILOT, AIRCREW AND MAINTAINER POPULATIONS WILL BE SEGREGATED BETWEEN 53E AND 53K. HMH-466 WILL RE-DESIGNATE HMHT-466 IN FY21 SHARING FRS DUTIES AND ASSUME MODEL MANAGER IN FY22 UNTIL FY28.
4) TWO AMARG MH-53Es ADDED TO INVENTORY IN FY15 FOR HMHT-302 FAMILIARIZATION AIRCRAFT CONVERSION, EST DELIVERY DATE OF FY17
5) SQUADRON (-) ACTIVATES, LOCATION MCAS MIRAMAR FY23
6) VMX-1 53 DET WILL BE DUAL T/M/S UNTIL FY21 WHEN THE DETACHMENT EXECUTES PCS TO YUMA AND DIVEST OF CH-53E OPERATIONAL TEST RESPONSIBILITIES.

CH-53E AND K (HMH) PLAN



CH-53E AND K (HMH) PLAN

DEVELOPMENTAL TEST Ongoing efforts include:

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

CH-53K:

1) GTV- conduct Long-Term Reliability Test, Aircraft Tear Down and Reconfiguration, Over Speed Test, C-17 Load and Live Fire Test and Evaluation.

2) EDMs- Shakedown and Envelope Expansion, Survey and Qualification Demonstration, Sea Trials, 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, and E-Cubed.

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 & 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 & Evaluation

- REV2D
- P3I
- Digital Interoperability
- DVE Phase III

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 provided essential medium lift assault support to ground forces in multiple theaters of operation. The Osprey enables expeditionary operations, maximizes ship-to-shore speed and agility, and creates options for ground commanders.

Unlike any aircraft before it, the MV-22 successfully blends the vertical flight capabilities of helicopters with the speed, range, altitude and endurance of fixed-wing transports. This unique combination provides an unprecedented advantage to warfighters, allowing current missions to be executed more effectively, and allowing new missions to be accomplished that were previously unachievable on legacy platforms. With a **cruise speed of 266 knots, twice that of most conventional helicopters**, the MV-22 greatly increases the flexibility available to the MAGTF commander and increases its survivability during combat operations.

The improved capabilities of the MV-22 translate into faster MAGTF response to global crises. When an earthquake, hurricane, or other natural disaster occurs, the MV-22 is able to respond within hours to ensure the appropriate assessment teams are on-scene and the relief efforts are quickly moved to the affected area

MISSION STATEMENT

Support the MAGTF commander by providing assault support transport of combat troops, supplies, and equipment, day or night, under all weather conditions during expeditionary, joint of 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): 266 knots / 280 knots

Configuration

- Mission Kits: Defensive Weapon System, Aerial Refueling (VARS)(FY-19)
- Armament: GAU-21 .50 Cal or GAU-18 7.62 on ramp; GAU-17 7.62 belly gun
- Sensors: AN/AAQ-27 (NavFLIR)
- Networked Systems: BFT; *NOTMA, *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; 40 min loiter overhead, 50 nm transit to 3000 ft MSL; 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 (KPP)
  - 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 hrs or less

MV-22B OSPREY (VMM) PLAN

ORGANIZATION

Marine Corps MV-22B squadrons are organized to break into 12- or 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 **80% complete with the medium lift transition**. There are fifteen FOC squadrons in the active fleet. The units in Okinawa are complete with the transition, leaving the West Coast, Hawaii, East Coast, and the reserve component to complete.

In the 4th quarter of 2016, VMM-268 relocated to Kaneohe Bay. They will be followed by VMM-363, in the fourth quarter of FY18.

A 17th active component squadron, VMM-362, will stand up beginning in the 4th quarter of FY18 in Miramar, CA.

In FY19, VMM-212 will stand up to complete the active component transition.

MV-22B OSPREY (VMM) PLAN

MANPOWER

The VMM detachment structure is in place as of FY17. Existing inventory shortfalls prevent actualization of full detachment staffing in the near term. There are grade disparities in VMMs, as in the rest of Marine aviation, as the Marine Corps feels the aftereffects of the force–shaping tools used during the 202K downsizing. The grade disparities are most evident in heavier field grade and junior enlisted maintainer inventories, whereas company grade and NCO/SNCO inventories are short. These shortfalls exacerbate the assignable inventory deficits.

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.

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 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.

HQMC Aviation is analyzing VMM relocation and activation timelines to ensure inventory can support both existing and emerging manpower requirements.

MV-22B OSPREY (VMM) PLAN

SUSTAINMENT

MV-22 readiness has been stressed due to accelerated deployments, accelerated squadron standups, continuous combat use since 2007 and emergent operational tasking. This operational tempo has been sustained in parallel with the medium lift transition from legacy assets, which is only 75% complete.

The MV-22 is a maturing platform that is scheduled to reach FOC in 2020; the **support base is maturing** in parallel. This base, both industrial and organic, has been challenged to meet established repair timelines and required depot throughput. Across the enterprise, changes to manning are being made to support detachment operations, organic depot facilities are expanding, contracting strategies are evolving to support timely delivery of long lead items, and industry continues to grow their support capability. These and other adjustments are being made to ensure the support base is able to meet logistical requirements driven by current and future MV-22 operational requirements.

Additionally, the SPMAGTF construct has driven the requirement to adjust the VMM T/O to support detachment operations. As MV-22 employment grows and evolves to meet CCDR demand, the industrial and logistics support base is working to keep pace. With this maturing platform that is scheduled to reach FOC in 2020, the support base is maturing in parallel.

16 AC SQDN X 12
1 RC SQDN X 12
1 RC SQDN X 12 in Transition
1 FRS X 20

MV-22B OSPREY (VMM) PLAN

18 AC SQDN X12
2 RC SQDN X12
1 FRS X 20

UNIT/LOCATION	PMAI	FY18				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	1	2	3	4
MAG-16																																									
VMM-161	12 MV-22B																																								
VMM-163	12 MV-22B																																								
VMM-165	12 MV-22B																																								
VMM-166	12 MV-22B																																								
VMM-363	12 MV-22B				MOVE TO MAG-24																																				
VMM-362	12 MV-22B			M									V																												
3MAW MATSS	4 MV-22B CFTD																																								
	1 MV-22 CMS PTT																																								
MAG-24																																								
VMM-268	12 MV-22B																																								
VMM-363	12 MV-22B	MAG-16																																							
1 MAW MATSS	2 MV-22B CFTD																																								
MAG-26																																								
VMMT-204	20 MV-22B																																								
VMM-162	12 MV-22B																																								
VMM-261	12 MV-22B																																								
VMM-263	12 MV-22B																																								
VMM-264	12 MV-22B																																								
VMM-266	12 MV-22B																																								
VMM-365	12 MV-22B																																								
VMM-212	12 MV-22B							M									V																								
2 MAW MATSS	3 MV-22B FFS																																								
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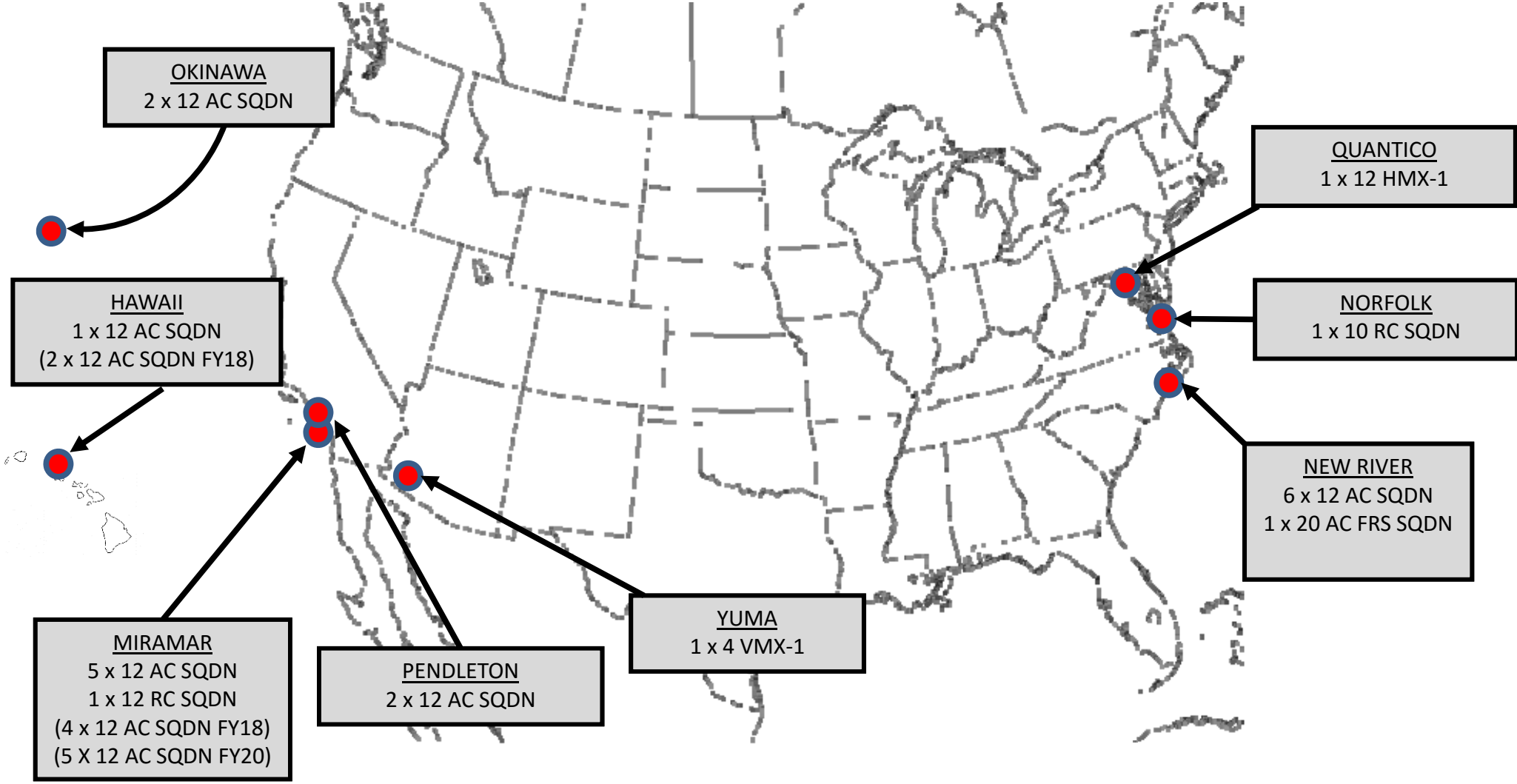
	2 MV-22B CFTD																																								
	1 MV-22B ICLE																																								
	1 MV-22B PTT																																								
MAG-36																																								
VMM-262	12 MV-22B																																								
VMM-265	12 MV-22B																																								
	2 MV-22B CFTD																																								
MAG-39																																								
VMM-164	12 MV-22B																																								
VMM-364	12 MV-22B																																								
3 MAW MATSS	2 MV-22B CFTD																																								
MAG-41																																								
VMM-764	12 MV-22B																																								
MAG-49																																								
VMM-774	12 MV-22B				V																																			
	2 MV-22B CFTD																																								
WHMO																																								
HMX-1	12 MV-22B																																								
	2 MV-22B CFTD																																								
AC / RC / FRS TOTAL UNITS		16/1/1				16/2/1				16/2/1				17/2/1				18/2/1				18/2/1				18/2/1				18/2/1				18/2/1				18/2/1			

MV-22B OSPREY (VMM) PLAN



MV-22B OSPREY (VMM) PLAN

RESERVE INTEGRATION

VMM-764 supports the active force, deploying in support of SPMAGTF(CR/AF).

In addition, VMM-774 received its initial complement of MV-22B, has been designated Safe for Flight and is working towards a projected FOC in 4Q FY18 aboard NS Norfolk, where it is well positioned to sustain reserve recruiting requirements and support East Coast forces.

MV-22B OSPREY (VMM) PLAN

INITIATIVES AND WAY AHEAD

The Osprey is the future of rotary wing medium lift for the Marine Corps. As the core of the MEU ACE and **centerpiece of MAGTF amphibious lift**, the Osprey must continue to evolve.

This evolution over the next five years will focus on:

1) Facilities, readiness and sustainability for the growing fleet
2) Aircraft survivability equipment upgrades
3) Software Reprogrammable Payload (SRP) Link 16 capable
4) Adding mission kits to support expanded mission sets (aerial refueling, enhanced defensive weapons)
5) Extended range (Aft sponson, additional receivers KC-10/KC-46)

AIRFRAME IMPROVEMENTS, SPECIFICS, TEST

In 2019 the Common Configuration Readiness and Modernization (CCRAM) Plan will begin. This concept will first bring the entire fleet to a **single common configuration**, from more than 70 configurations now, and then start improvements leveraging technologies from joint multi-role (JMR), future vertical lift (FVL), and other emerging technology initiatives. These will provide a capability leap to ensure relevance and improved readiness at a lower cost for decades, will improve reliability and decrease direct maintenance man-hours per flight hour.

STRATEGIC AIR-TO-AIR REFUELING (AAR)

The V-22 and KC-130 are a formidable tandem for the MAGTF commander. The addition of joint and coalition strategic tankers will increase the flexibility of the combatant commander to utilize the V-22. In 2014, a flight clearance was completed for the V-22 to conduct air-to-air refueling from the Air Force KC-10. Further testing and flight clearances are planned for the KC-46. OMEGA-707 test was completed in July 2016 with a flight clearance produced shortly after.

V-22 AERIAL REFUELING SYSTEM (VARS)

Planned to have the initial capability in FY18 being able to refuel fixed wing, tiltrotor and rotary wing aircraft. Fielding of the full capable system will be in FY19. This system will be able to refuel all MAGTF aerial refuel capable aircraft with approximately 10,000 pounds of fuel per each VARS-equipped V-22.

COMMON CONFIGURATION READINESS AND MODERNIZATION PLAN (CCRAM-PLAN):

- 2-23 aircraft installs per year (FY18 until complete)
- Initial Block B to Block C installs for 129 aircraft.
- Subsequent CCRAM aircraft tech insertions will occur every 4-6 years in perpetuity.

(*Some readiness and reliability improvements as well as capability improvements listed below will be incorporated into CCRAM.)

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)
Infra-Red Suppressor Upgrade: 6-36 installs per year FY21-Until Complete (129 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 Reliability Improvements: 4-24 installs per year FY18-Until Complete (129 Installs)
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)
V-22 Aerial Refueling System (VARS): 10-24 aircraft mod installs per year FY18-To Complete (345 Installs). Procure mission kits 4-18 per year FY-18-FY22 (45 Kits)

Multi-Spectral Sensor: Advanced Targeting Sensor (ATS) with EO/IR optics, Laser Target Designator and Ranging (LTD-R), IR Marker, and Video Data Link (VDL). Installs beginning in FY22 (345 installs). In the future this issue will fall under a CCRAM tech insertion.

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 FY18-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 : Ongoing efforts include:

1) Fleet sustainment – Vehicle Management System (VMS) and JVX Application System Software (JASS) software drops
2) Nacelle improvements including Improved Inlet Solution (IIS) and Infra-Red Suppressor (IRS) redesign
3) Envelope expansion for shipboard operations
4) High altitude operations and defensive maneuvering
5) Strategic tanker envelope expansion

OPERATIONAL TEST AND EVALUATION : Ongoing efforts include:

1) Support of integrated test for aircraft and mission planning software development
2) Operational assessments of flare effectiveness
3) Defensive weapon system envelope expansion
4) Digital interoperability
5) Integrated aircraft survivability equipment
6) Future capabilities

UNMANNED AIRCRAFT SYSTEMS (VMU) PLAN

VALUE TO THE MAGTF

The Marine Corps' family of unmanned aircraft systems (FoUAS) provides support to any sized MAGTF for battlespace awareness, offensive air support, target acquisition, and force protection. FoUAS will provide the MAGTF a digital communication backbone; MUX will provide an assault support and transportation capability.

Marine Corps UAS employment will continue to enhance and extend the lethal and non-lethal capabilities of MAGTF and joint force commanders, facilitating advancements in observation, understanding, and influence on the battlefield. The FoUAS will play a key role in all USMC missions across the range of military operations to include forward presence, security cooperation, counterterrorism, crisis response, forcible entry, prolonged operations, and counterinsurgency.

RQ-21A provides UAS support to the Marine Expeditionary Unit, regiments, and MARSOC. RQ-21A enhances the capabilities of MEU and regimental-sized units by providing a long endurance, expeditionary, multi-mission platform that is shipboard capable. RQ-21A is also able to operate from land-based forward operating bases. Characterized by its runway independence, multi-sensor, and ES capability, the **RQ-21A will enhance the MAGTF commander's battlespace awareness** and enhanced target acquisition capability.

With its multiple payload capacity, the **RQ-21A will continue to evolve** to meet the shifting priorities of the MAGTF commander. A key enabler for realizing the full capability of the RQ-21A is its L-class amphibious carrier shipboard capability. Currently, ship installs are complete for LPD-17 through 25 class ships with LPD 26 and 27 planned for late FY18. Marine aviation is pursuing RQ-21A compatibility for all ARG shipping in order to provide maximum employment flexibility for the MAGTF commander both afloat and ashore.

MISSION STATEMENT

Support the MAGTF commander by conducting multi-sensor reconnaissance and surveillance, and facilitating the destruction of targets, from unmanned aerial platforms, during expeditionary, joint, and combined operations.

This mission statement accurately reflects the VMU's role in the MAGTF as an aerial reconnaissance system supporting target acquisition, command & control and battlespace awareness support to the MEB or MEU commander and their subordinate units.

UNMANNED AIRCRAFT SYSTEMS (VMU) PLAN

CAPABILITIES

RQ-7BV2 SHADOW

MEF/MEB LEVEL SUPPORT

The RQ-7B Shadow replaced RQ-2 Pioneer in 2007. The Marine Corps has continued to leverage interoperability and commonality with Army Shadow units conducting similar missions. The systems currently fielded among the VMUs are progressing with upgrades to be in compliance with DoD mandates for type 1 encryption on UAS. The RQ-7B is a rail launched aircraft that is dependent on a short runway for landing. In 2018, VMU-3 will conduct limited RQ-7B operations and VMU-4 will begin transition out of RQ-7B near the end of the fiscal year.

RQ-21

MEU/REGIMENTAL LEVEL SUPPORT

RQ-21 is a rail-launched, Sky Hook Recovery System (SRS) aircraft.

Five aircraft, one launcher, one SRS, 2 Integrated Trailer-ECU-Generator (ITEG) associated support equipment and 4 HMMVS **constitute (1) RQ-21A system**

Combat radius – 50 nautical miles (control envelope)

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

Payload – EO/IR/IR Marker/Laser range finder; with future payload capabilities of EW, Laser designator, SAR, GMTI.

Twenty-five pound useful load (fuel and payload)

Automated Identification System (AIS)

MARINE UNMANNED AIRCRAFT SYSTEMS

CAPABILITIES

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

A 2006 decision by the Assistant Secretary of Navy for Research, Development, and Acquisition (ASN RDA) directed the overall management of all UAS programs (both Navy and Marine Corps) to be conducted by Naval Air Systems Command. In 2007, in conjunction with the previous ASN RDA guidance, the Commandant assigned the Deputy Commandant of Aviation as the advocate for all UAS, to include Small UAS.

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.

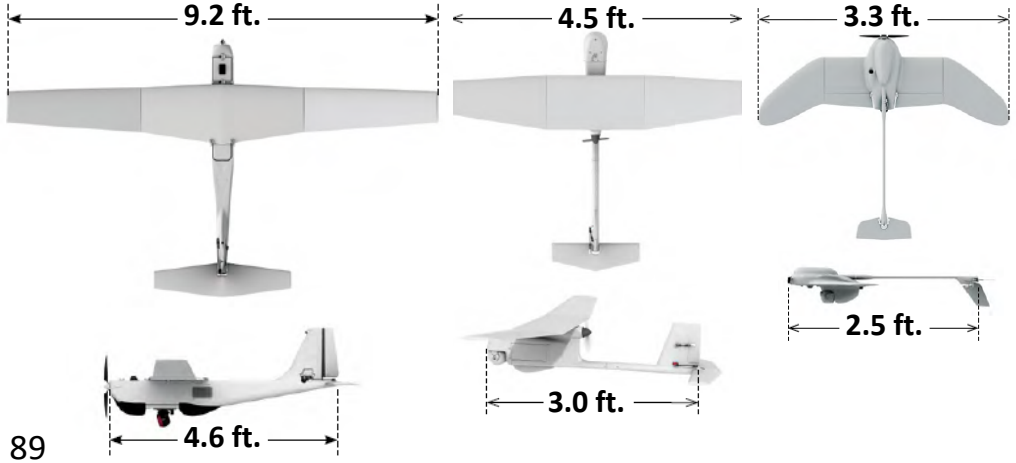
The current SURSS FoSUAS consists of three UAS platforms all using a common ground control station, or GCS: RQ-20A Puma, RQ-11B Raven, and RQ-12A Wasp. VTOL and nano-VTOL SURSS will complement the capabilities of the current FoSUAS in areas where vertical obstructions or confined operations create unique challenges. These VTOL and nano-VTOL SURSS include the SkyRanger, InstantEye, and PD-100 Black Hornet, fielded in response to an UUNS. With successful field assessments, these systems may be included in the SURSS Block 3 decision.

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&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.

The SURSS program manager (PM) at the MEF tracks distribution among all subordinate units. I and II MEF systems are warehoused and maintained at the Training And Logistic Support Activity (TALSA), West and East, located aboard Camps Pendleton and Lejeune, 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 CAPABILITIES

Platform:	**RQ-20A Puma**	**RQ-11B Raven**	**RQ-12A Wasp**
Combat Radius:	10 NM	5 NM	3 NM
Endurance:	180 min.	90 min.	50 min.
Speed:	25-45 KCAS	17-44 KCAS	20-45 KCAS
Weight:	14 lbs. (6.3 kg)	4.2 lbs. (1.9kg)	2.85 lbs. (1.3kg)
Operating Alt:	500ft AGL	100-500ft AGL	500ft AGL
Payload:	gimbaled EO/IR; EO/IR illuminator; sec power for comm relay pkg, etc.	EO/IR	gimbaled



UNMANNED AIRCRAFT SYSTEMS (VMU) PLAN

CAPABILITIES

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. Currently in development, 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 that is collected. 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 FY18 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 FY18 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.

FOR EW (INTREPID TIGER)

In FY18 we will be conducting development and operational test on Intrepid Tiger EW payloads for RQ-21.

OTHERS:

In FY18 we will continue working on a Wide Area Persistence Surveillance capability. These are POM-18 efforts for the USMC but are currently being supported by Office of Naval Research (ONR).

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. Alignment aboard an air station 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 5 RQ-21 systems and will declare FOC during 2018. VMU-3 will begin full squadron transition and establish IOC with 4 RQ-21 systems in 2018. VMU-4 with accept delivery of its first system of RQ-21 in the first quarter of FY2019.

Changes :

VMUs will transition to RQ-21 by 2018 instead of 2020, and

VMU will transition fully out of RQ-7 Shadow by FY2019.

Squadron	Marine Aircraft Group	Air Station
VMU-1	MAG-13 (RQ-21)	MCAS Yuma, AZ
VMU-2	MAG-14 (RQ-21)	MCAS Cherry Point, NC
VMU-3	MAG-24 (RQ-7)	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 1st 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 (UAS/EW Officer) 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

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.

After the creation of 7315 as a PMOS, inventory has lagged behind structure requirements, but the gap is closing each year. As initial cohorts of TBS accessed 7315s 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 and MUX manpower requirements are identified, proliferation of UAS billets throughout the MAGTF will be analyzed.

SUSTAINMENT

Current inventory of the RQ-21 Blackjack consist of 16 systems, consisting of 5 air vehicles per system. MSD is expected to occur in late FY18 with full fielding in the 2nd quarter of FY19. **Major increases for parts allowances, expansion of composite level repair, as well as in increase in organizational and intermediate-level repairs will bolster RQ-21 readiness in 2018.**

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 is going to move into the BISOG funding line in FY19. This will align 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.

UNMANNED AIRCRAFT SYSTEMS (VMU) PLAN

RESERVE INTEGRATION

VMU-4 (-) will transition to the RQ-21A in FY21 to provide operational depth for this high demand / low density asset. In the long-term, VMU-5 (-) is planned to activate in FY23 to provide additional flexibility and depth to the VMU community.

INITIATIVES / WAY AHEAD

In an effort to formalize RQ-21A training, PMOS schools will move from Fort Huachuca to MCAS Cherry Point. HQMC Aviation is coordinating the transition of structure and staffing with M&RA and TFSD. Structure requirements for instructors will remain the same.

Group 3 manpower requirements within active duty VMU squadrons are transitioning in FY18 to match the system allocations to each squadron. 7315s remain in high demand throughout the MAGTF. New billets are sought throughout all combat elements of the MAGTF and supporting establishments. As VMU detachments continue to support deployed and CONUS based MAGTFs, demand signal will continue to be weighed and balanced to benefit the VMU community and the MAGTF.

In the short time since the RQ-21 IOC'd in January of 2016, it has deployed in combat both aboard ship and from land-based detachments. This accelerated deployment into worldwide service has encompassed thousands of combat flight hours to meet its robust demand. Despite overcoming many operational obstacles, the program is still without a formal school for both its maintainers and operators.

In 2018, CNATT MARU at MCAS Cherry Point will be standing up RQ-21 training for Marines with the 6314 MOS (UAS Maintainer).

In 2019, MAG-14 will stand up the RQ-21 Fleet Replacement Detachment at MCAS Cherry Point for Marines with the 7314 (UAS Operator) and 7315 (UAS MAGTF EW Officer).

As the Marine Corps divests from the RQ-7B, it will be necessary to realign UAS training with the current Group 3 program of record – the RQ-21. Although the Marine Corps has enjoyed a successful partnership with the US Army on the operation of the RQ-7B, it will be necessary to transition training structure and resources from the RQ-7 schoolhouse at Fort Huachuca, AZ to like RQ-21 training organizations at MCAS Cherry Point. This will align the Marine Corps' training organizations, personnel, and resources with the UAS POR being employed by Marine contingency operations today.

Marine Corps UAS is paving an uncharted path in the world of naval UAS with a ship-board capable Group 3 program of record in direct support of the MEUs for the first time. The RQ-21 has a number of planned upgrades that will bolster its current capability and establish itself as a vital component of the MAGTF.

Initiatives are underway to **increase the RQ-21A performance and capabilities**. The three highest priorities for Blackjack improvements are **improved sensor with laser designator**, a **high-reliability engine**, and a **beyond-line-of-sight (BLOS) control** capability. These initiatives will expand the capability and persistence of the Blackjack in the battle space and are integral to realizing the future potential of the system. Several payloads with the appropriate size, weight, and power (SWaP) are being developed for integration on the Blackjack. Hyperspectral payloads capable of detecting explosives; EMS payloads capable of monitoring spectrum; synthetic aperture radar (SAR) / ground moving target indicator (GMTI) capable of detecting targets through clouds and tree cover; miniature precision weapons and quadcopter launch and recovery systems…these are examples of payloads in either research or development for RQ-21A.

UNMANNED AIRCRAFT SYSTEMS (VMU) PLAN

Additionally, Marine Corps aviation is aggressively pursuing a JROC-approved Group 5 requirement that will offer an amphibious and persistent UAS that will be network-enabled, digitally interoperable, and provide lethal and non-lethal fires. MAGTF Unmanned Aircraft System Expeditionary (MUX) will transform the way the Marine Corps fights as a MAGTF both on and off-shore.

Acquiring needed upgrades for the RQ-21 as well as obtaining a Group 5 multi-role UAS capable of operations from expeditionary locations will require significant investment and development in order to achieve these critical capabilities for the MAGTF:

1) MUX
2) ALTICAM 14
3) Cosworth Engine
4) Bandwith Efficient Common Datalink
5) UAS Payloads (IT II integration, Spectral Bat, Split Aces)

EXPERIMENTATION AND INNOVATION

Led by MAWTS-1 and VMX-1, and in close coordination with MCTOG, MCLOG, MCWL, MARSOC, national laboratories, and industry, Aviation will continue tactical demonstrations to validate innovative uses for emerging UAS technologies. The lessons learned from this experimentation will inform programmatic and employment decisions across Marine aviation's FoUAS.

JOINT RESEARCH AND COLLABORATION

Programs such as the DARPA TERN, DARPA Aerial Reconfigurable Embedded System (ARES), and ONR Autonomous Aerial Cargo Utility System (AACUS) will inform future UAS capability decisions. Technologies developed in these, and other, research programs will be critically evaluated to assess feasibility for transfer to existing or future programs of record. The Marine Corps is working closely with the Navy on MUX, with TERN as a potential platform solution and AACUS as a future autonomy solution, and is a co-sponsor of the ARES effort with the Army.

DIGITAL INTEROPERABILITY

Because of their persistence, unmanned systems are perfectly suited to serve as airborne data network relays and gateways. Emerging technologies, such as SRP, will be integrated onto unmanned platforms at the earliest opportunity.

ELECTRONIC WARFARE (EW)

UAS are a component of the MAGTF EW concept. Coupling new UAS employment concepts with emerging payloads provides the Marine Corps the ability to influence the EM Spectrum--providing additional critical advantages in the battle space. UAS provide the MAGTF commander with a persistent lethal and flexible capability.

NATIONAL AIRSPACE (NAS) INTEGRATION

The Marine Corps has taken a key role in ground based sense and avoid (GBSAA) systems for UAS. It operated the first certified GBSAA system at MCAS Cherry Point. In conjunction with DoD, NASA, and the FAA, the VMU community will continue to develop standards and procedures for UAS integration in the NAS as well as field similar systems to the rest of the MCASs that have VMU squadrons.

UNMANNED AIRCRAFT SYSTEMS (VMU) PLAN

UPGRADES

Bandwith Efficient Common Data Link (BE-CDL) (2019),

Cosworth Engine (2018), (airframe ECP required for integration)

ALTICAM 14/Laser designator (2019)

EW

RQ-21 Intrepid Tiger II Integration Payload, (28) payloads (2021-23)

DEVELOPMENTAL TEST

1) SIGINT payload
2) ALTICAM-14
3) SAR/GMTI payload
4) Bandwidth efficient common data link
5) Cosworth engine

OPERATIONAL TEST AND EVALUATION

1) EO/IR with laser designator
2) SIGINT payload
3) Bandwith Efficient Common Data Link

UNMANNED LOGISTICS SYSTEMS – AIR (ULS-A)

ULS-A ias an HQMC I&L-led effort to develop Group 3-sized UAS that can transport loads between 50 and 500 pounds organically, in support of LCE and GCE operations. The Marine Corps has teamed with ONR, ARL and the Army in developing autonomous distribution. Experimentation and systems development is occurring with ARL's TRV-50 and TRV-300 systems.

UNMANNED AIRCRAFT SYSTEMS (VMU) PLAN

MAGTF UNUNMANNED 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.

The MUX ICD informs a system that provides the MEF/MEB-sized MAGTF with an advanced multi-mission platform.

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 electronic warfare, a C4 bridge, ISR, logistics transport and strike capability 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 and USN 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 & technology (S&T) projects, and tactical demonstrations (TACDEMOS) in conjunction with large force exercises (LFE). The DARPA Tern and ARES demonstrator systems are planned to make first flight in FY-18, as are several of the industry prototypes.

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, and reduce risk.

VMX-1 and MAWTS-1 ADT&E teams will continue to conduct testing and evaluation of UAS and UAS payloads. The intent of these opportunities is to put emerging UAS technologies into Marines' hands and allow them to employ the systems in various training or real-world scenarios.

Additionally, during these iterative development processes UAS will be utilized to evaluate software defined radios to support multiple waveforms serving as key persistent nodes in distributed network concepts.

CURRENT FORCE PAA:
1 AC VMU SQDN x 6 RQ-21A
1 AC VMU SQDN x 2 RQ-21A
1 AC VMU SQDN x 4 RQ-7Bv2
1 RC VMU SQDN x 2 RQ-7B

UNMANNED AIRCRAFT SYSTEMS (VMU) PLAN

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

		FY18				FY19				FY20				FY21				FY22				FY23				FY24				FY25			
		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																								
MAG-14 CHERRY POINT																																	
VMU-2	6 RQ-21A																																
FRD	1 RQ-21A			Y																													
MAG-13 YUMA																																	
VMU-1	6 RQ-21A		V																														
MAG-41 RESERVE COMPONENT CAMP PENDLETON																																	
VMU-4	2 RQ-21A		X	V																													
MAG-14 (T/M/S LEAD) YUMA																																	
VMX-1	1 RQ-21A	X			V																												

AC/RC/FRD TOTAL UNITS	3/1/1
SYSTEM TOTALS (RQ-21A)	20

X = BLACKJACK TRANSITION BEGINS

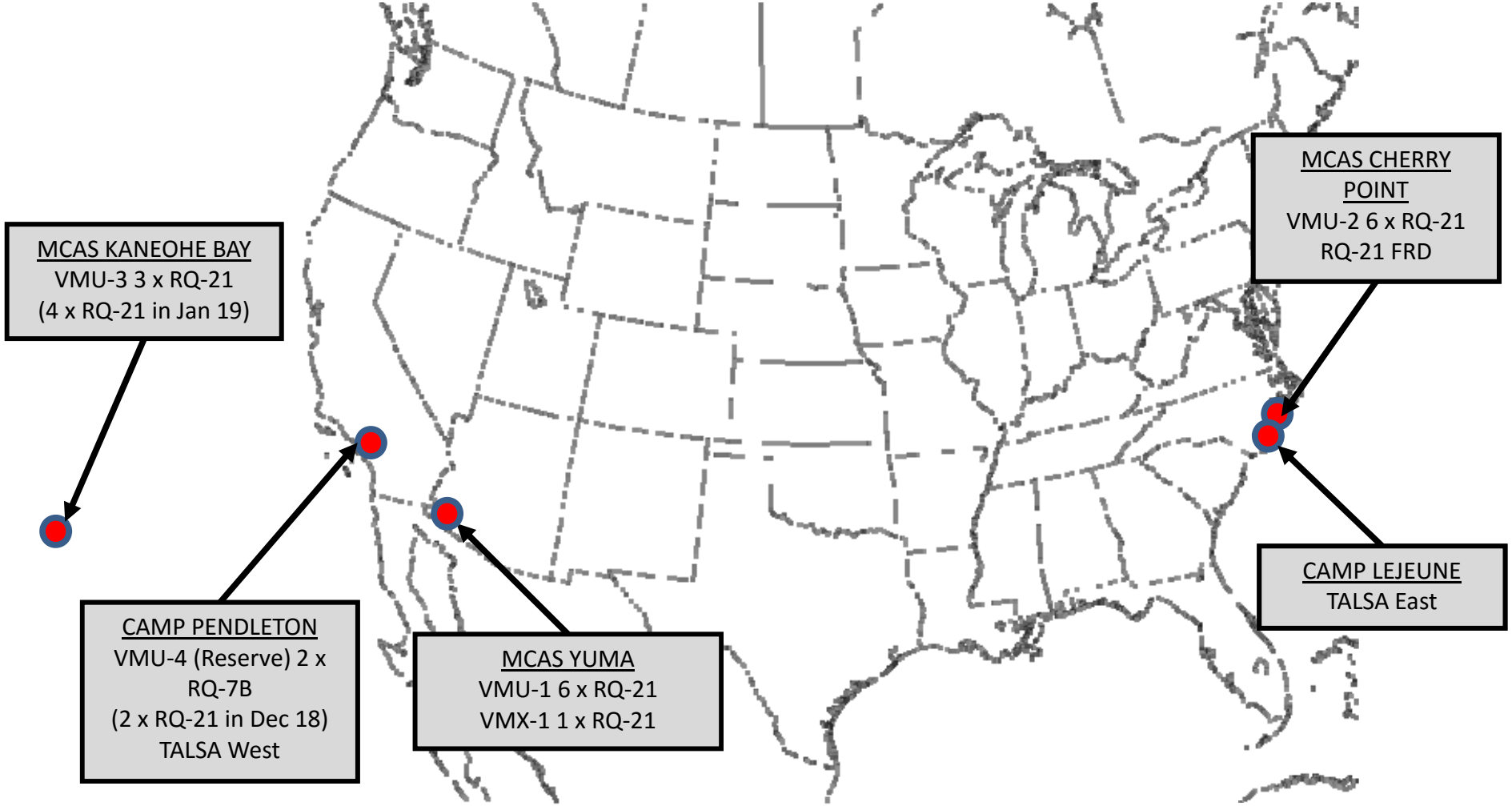
Y = FIRST SYSTEM INTRODUCED

V= TRANSITION COMPLETE

NOTES:

1) VMUS WILL BE FULLY DIVESTED FROM RQ-7B BY 2ND QTR FY19.
2) MAG-14 AND MAG-13 HABITUALLY SUPPORT THREE MEUS EACH.
3) MAG-24 WILL HABITUALLY SUPPORT THE 31ST MEU.

UNMANNED AIRCRAFT SYSTEMS (VMU) PLAN



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 (D)

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 26 commercial derivative aircraft in 10 locations CONUS/OCONUS.

- (1) C-20G
- (13) UC-12F/M/W
- (12) UC-35C/D

In accordance with the OSA Master Plan (MROC DM 57-2010), the Marine Corps is in the process of completing the transition on 2 TMSs. Additional funding is required for the following:

- (2) C-40A
- (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. VMR-1 is scheduled to relocate from MCAS Cherry Point, NC to NAS JRB Fort Worth, TX in 4th QTR of FY17.

Recently the Marine Corps has:

- Divested of the (2) C-9B aircraft
- Moved VMR-1 (Flag) to Fort Worth
- Accelerated procurement of C-40A; timeline is TBD

MANPOWER

OSA operators are from the bases and stations (I&L).

SUSTAINMENT

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 will re-locate to NAS JRB Ft Worth and reflag as a 4th MAW unit in FY18**. The C-9 aircraft were divested in FY17 and the squadron awaits delivery of C-40 aircraft beginning in FY19. Realigning the remaining CONUS-based OSA assets under 4th MAW remains under analysis based on availability of additional structure

OPERATIONAL SUPPORT AIRLIFT (OSA) PLAN

FORCE PAA:

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

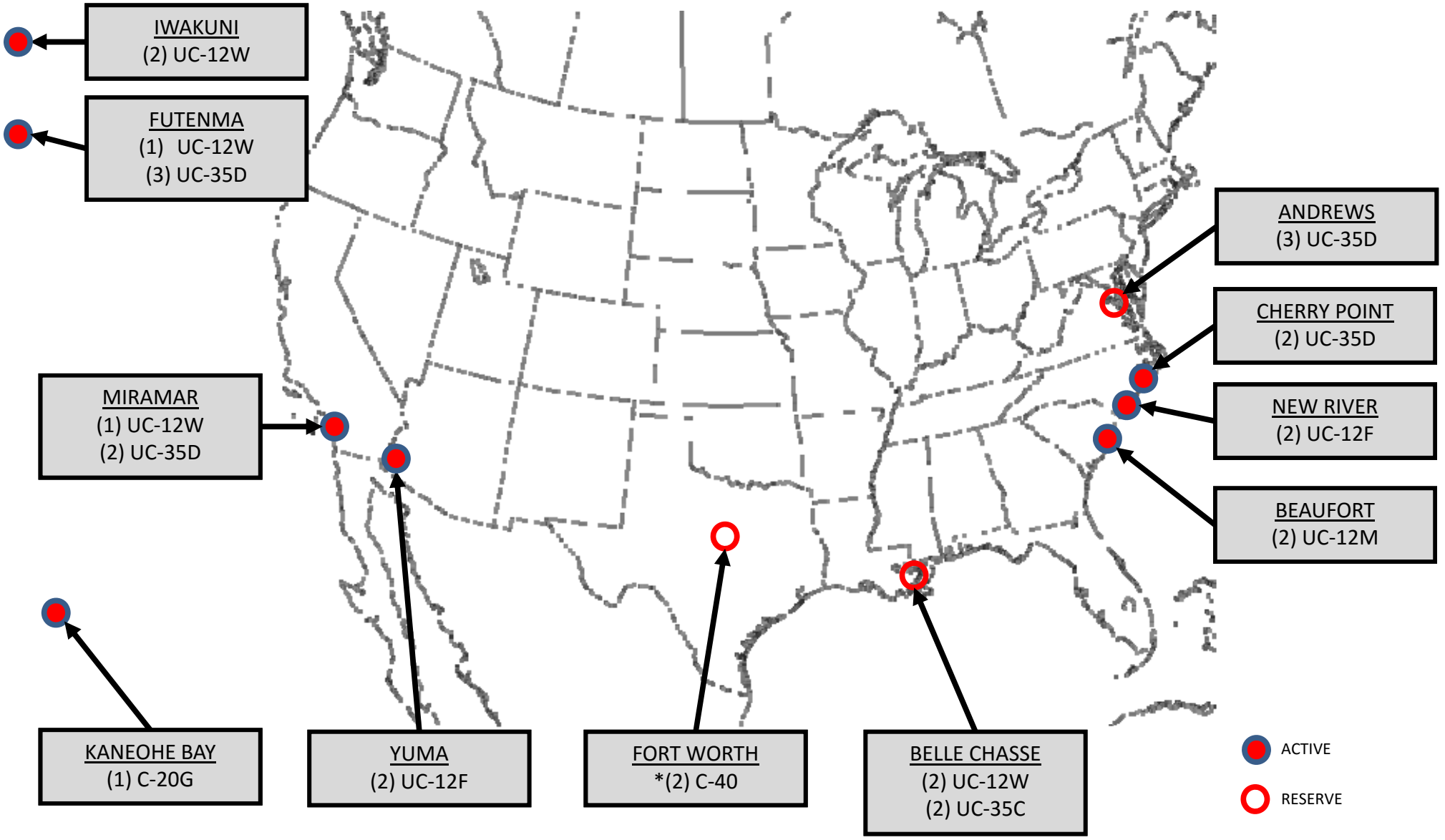
FORCE GOAL PAA :

(12) UC-12 W
(12) UC-35 ER
(1) C-20 ER
(2) C-40 A

USMC OSA		FY17				FY18				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	1	2	3	4	1	2	3	4
ANDREWS	(3) UC-35D																																											
BEAUFORT	(2) UC-12M																																	0	Sundown										
	(2) UC-12W																																	2											
BELLE CHASSE	(2) UC-12W																																											
	(2) UC-35C																																											
CHERRY POINT	(2) UC-35D																																											
FUTENMA	(1) UC-12W																																											
	(3) UC-35D																																											
IWAKUNI	(2) UC-12W																																											
KANEOHE BAY	(1) C-20G																																											
MIRAMAR	(1) UC-12W																																											
	(2) UC-35D																																											
NEW RIVER	(2) UC-12F										0	Sundown																																
	(2) UC-12W										2																																	
YUMA	(2) UC-12F																																					0	Sundown						
	(2) UC-12W																																					2							

AC/RC/FRS TOTAL UNITS: 18 / 7 / 0
AIRCRAFT TOTALS: 25

OPERATIONAL SUPPORT AIRLIFT (OSA) PLAN



* USMC divested of C-9B in April 2017. C-40A delivery is TBD.

OPERATIONAL SUPPORT AIRLIFT (OSA) PLAN

INITIATIVES AND WAY AHEAD

UPGRADES

UC-12W Ballast kit for CG assistance
UC-12W Increased gross weight kit

ASE/SURVIVABILITY

UC-35 ASE – Last aircraft for mod (166766) November 2017 induction *
UC-35 TMS ASE Gen 3 upgrade FY18Q2/Q3 *
UC-12W ASE 3rd Dispenser: Installs on-going; 4 of 6 complete *
UC-12W Aural Tone: Installs on-going; 4 of 6 complete *
UC-12W WAAS: Installs on-going; 4 of 6 complete *
UC-12W NVIS: Installs on-going; 2 of 6 complete *
UC-12W Sat Phones: Installs on-going; 4 of 6 complete *

INTEROPERABILITY

C-20 ADS-B Out version 2; GAC solution available *
UC-35 INMARSAT phone upgrade approved
UC-35 ADAP to protect GPS position from intentional jamming approved

*Install will be planned in accordance with maintenance schedule

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

THE AVIATION EXPEDITIONARY ENABLERS VISION

As outlined in the 2016 Marine Corps Operational Concept (MOC) and throughout this year's *Marine Aviation Plan,* the operating environment is evolving and our next conflict is largely unpredictable. What remains constant though is the role of aviation's enablers – *the ability and credibility to control our own airspace and operate from expeditionary sites equates to MAGTF freedom of action*. As we field exponentially more capable systems, the ways in which the **MACCS enables MAGTF freedom of action** must evolve as well. We now must refocus, innovate, and exploit the future of warfighting across the MAGTF in ways that are different from what has been done in recent history, such as recognizing the role information as a weapon and manning, training, and equipping a force where digital interoperability in the norm. This transformation is what the aviation expeditionary enabler community has embarked upon.

The future MACCS and AGS communities will be highly expeditionary; operate in a distributed manner; and be capable of fusing and integrating MAGTF aviation command and control, sensor input and weapons data across the joint force to provide shared situational awareness and increase the decision space for the MAGTF commander. Because of the unique position as the integrator between the ACE and GCE, the aviation enablers must ensure the ability to bridge divergent communication efforts within the MAGTF and joint force by providing beyond line-of-sight (BLOS) tactical data links (TDLs), data forwarding, radio relay, tactical gateways, and ground-based air defense (GBAD) capable of engaging low-radar cross section targets.

The most critical resource is the individual Marine. As we transition to a common set of equipment, new operational concepts, and operations in complex battle spaces, we **must transition to a training paradigm that provides baseline knowledge for all AC2 operators to excel**. The goal for MACCS operators is to become air command and control experts who will assist the commanders and decision makers in receiving and interpreting operational information and translating this information into effective direction and control for Marine aviation.

The primary missions for our tactical agencies will remain throughout our MACCS modernization. As new common sets of equipment are fielded, the ability to employ future hybrid agencies becomes relevant. For example, the clearance requirements for extended range munitions have made knowledge of the ground situation and MAGTF fires critical for all MACCS agencies. The proliferation and persistent presence of UAS and civilian aircraft through the AO require all MACCS agencies to have access to an air picture. Integration with special operations forces and the increased capabilities of new MAGTF platforms, such as the F-35 and MV-22, will enable hybrid employment options for MACCS agencies as we modernize and align our equipment and personnel.

We must recognize the significant challenges of the future operating environment and develop an aligned approach to fight and win. The **MACCS and AGS communities enable the MAGTF commander to maintain control of the battlespace**, maximize effects, and shorten the kill chain. The next generation of aviation expeditionary enablers are approaching Initial Operational Capability (IOC) of our AC2 family of systems (CAC2S, TPS-80 G/ATOR, and CTN) and we are on pace to provide game-changing capabilities to the MAGTF ensuring continued freedom of action.

The Aviation Command and Control (AC2) Transition Task Force (TTF) has been stood up to align all aspects of DOTMLPF. Additionally, a MACCS independent readiness review is being stood up to ensure a comprehensive understanding of the factors driving, or detracting from, readiness across the community. The AC2 TTF and the MACCS IRR will ensure the MACCS is optimized to support the MAGTF of the future.

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

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, resource management, planning, communicating instructions, monitoring results, making decisions, supervising execution and making assessments. The Marine Air Command and Control System serves as the catalyst to the timely employment of Marine aviation assets, effective combined arms, and enabling 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 commander with the agencies and assets necessary to exercise aviation command and control (AC2) 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), the TAOC will share data with the Navy's Cooperative Engagement Capability (CEC) network where it will exchange high fidelity radar track data.

The combined capabilities of CAC2S, CTN and the future TPS-80 have 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 SUPORT (AGS) PLAN

DIRECT AIR SUPPORT CENTER (DASC)

The **DASC is the critical link between the ACE and GCE** within the MACCS. The DASC has continued to conduct its core mission of processing immediate requests for air support and has also 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, or 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 HVAs** in an evolving battlespace is a critical tool for the ACE commander to meet force protection and AAW responsibilities. LAAD is in the initial phases of transitioning to an improved integrated air and missile defense (IAMD) family of systems (FoS) to meet the primary threat set threat UASs, and the secondary threat set of cruise missiles and manned FW/RW aircraft.

LAAD battalions have successfully conducted ground defense of 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, LAAD 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 SUPORT (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 incorporates 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 enable 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 tasked-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, will 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 SUPORT (AGS) PLAN

MWCS detachments will provide the data communications requirements for a multi-functional C2 node providing planners more flexibility as 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 & control to link warriors, weapons platforms, and targets, massing desired effects in a timely manner.

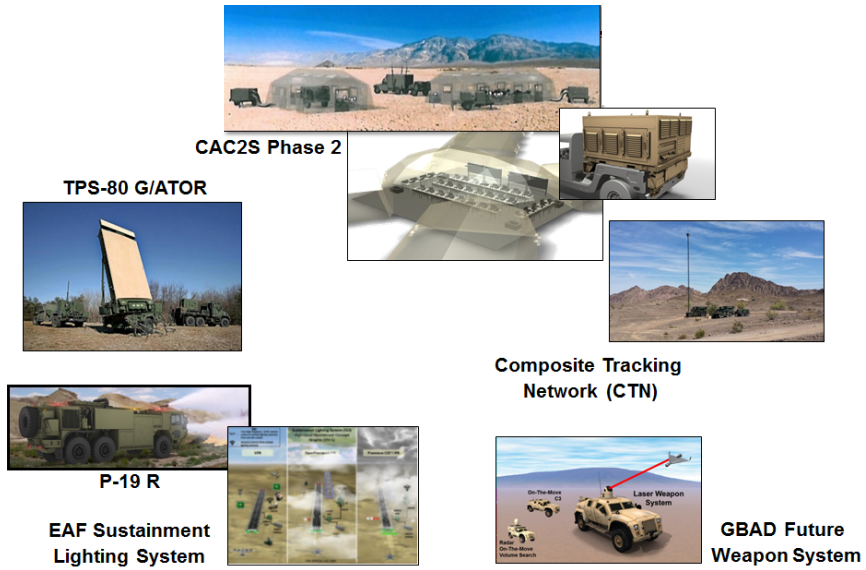
The ability to command and control dispersed forces as they aggregate will become a core competency in this new force construct as highlighted by dispersed forward presence and quick crisis response. **Balanced, expeditionary multi-functional nodes** are ideally suited to respond quickly to global contingencies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

AMPHIBIOUS COMMAND AND CONTROL

The *Marine Corps Operating Concept* (MOC) reaffirms that the Marine Corps is a critical portion 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.

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

Marine Corps Aviation & Tactical Air Control Group (TACGRU) leadership have recently signed a naval integration MOU that formalizes the agreement to integrate aviation command & 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 SUPORT (AGS) PLAN

Current lines of effort include aviation command & 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 & Communications (C3) students.

To date, **four Navy TACRON students have graduated WTI**. The goal is to have at least one TACRON member per MEU who has graduated WTI. This is required due to emerging aircraft capabilities aligning 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. Also, forward-deployed C2 nodes equipped with netted sensors, 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 teams sensors and shooters together to address challenging AAW and air defense problem sets. Under the IFC concept, sensors from air, land, or sea providing high fidelity target data enable 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 and weapons will be employed at their maximum effective kinematic range. 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 SUPORT (AGS) PLAN

DIGITAL INTEROPERABILITY

Digital interoperability is a key component in synthesizing ACE combat power. 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 seamlessly flow 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 will work to 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 SUPORT (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, and 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: 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 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 SUPORT (AGS) PLAN

UPDATES

Phase 1

- All (20) Phase 1 systems have been fielded to the MASS, MACS, MTACS and Air Control Training Squadron (ACTS)

Phase 2

- Initial (10) systems fielded to MACS units and MCCES: IOC FY17 / FOC FY20
- Contract for remaining systems in process of being awarded
- 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 the Command and Control Air Operations Suite - Command and Control Information Services (C2AOS-C2IS).

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 SUPORT (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 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 in 2017 through 2019 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 & TPS-80 NIFC-CA integration.
3) TPS-80, CTN & CAC2S need to incorporate additional message sets the communicate IOT use **TPS-80 as a target provider for Navy & 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 SUPORT (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. 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 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&2) FOC: 2024 (Block 1&2).
2) First 2 systems delivered in March of 2017.
3) Operational Assessment occurs in October 2017 in conjunction with WTI 1-18.
4) G/ATOR Block 2 Operational Assessment March 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 SUPORT (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 required 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 technical solution per DoD mandates
2) Mitigate obsolescence/DMSMS and issues in array power supply, receiver and exciter cabinets & control shelter op/console/servers
3) Increase reliability availability and maintainability (RAM)
4) Maintain same frequency and signal strength
5) Improve mobility and survivability
6) Reduce power requirements and weight

MARINE EXPEDITIONARY ENABLERS:
MARINE AIR COMMAND AND CONTROL SYSTEM (MACCS) AND AVIATION GROUND SUPORT (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) On-going ECPs to address obsolescence
3) Antenna transmitter group ECPs
4) Radar console/servers tech refresh
5) Information Assurance & SW Integration
6) ECCM updates (HW & SW)
7) Shelter Tech refresh (limited)
8) TBM SW improvements
9) RES development

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 SUPORT (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

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 supported airfields.

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

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 FY18

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 and manned fixed-wing (FW), 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, called the **Marine Air Defense Integrated System (MADIS)**, will be fielded in three increments:

GBAD FWS Increment 1 (2022-2027). **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, already undergoing 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 objective 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.**

G BAD FWS Increment 3 (TBD). Provides protection 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. Currently evaluating Army Indirect Fire Protection Capability Increment 2 – Intercept (IFPC2-I), Iron Dome/Sky Hunter.

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

Inc 2 MADIS Mk2
(Sensor, C-UAS interceptor, gun, EW)

M-SHORAD kinetic

M-SHORAD non-kinetic

Inc 2 MADIS Mk1
(Missile, gun, EW)

Inc2 MADIS Mk2
(Sensor, Directed energy, gun, EW)

US Army IFPC2-I

METEOROLOGICAL AND OCEANOGRAPHIC (METOC)

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 (CMC/APX-1, OPNAV N2/N6E) joint letter of 17 May 2013
- 11 of 14 systems delivered to the MATC Dets including MACS-24 Det A.
- Funding shortfall for (3) systems remains = ~$12M-$14M

2) NEXGEN supported deployments/exercises
- Weapons & Tactics Instructor (WTI) Course and Large Scale Exercises (LSE).
- Continues to provide METOC support to aviation operations around the world.

Issues

Oceanographer of the Navy is the resource sponsor with funding not identified as BISOG.

(Funding designated as OP/N is Other Procurement/Navy.)

1) Funding Issues
- ~$3M OP/N for remaining Intelligence BNs Sub-systems
- ~$5.5 OP/N for tech refresh …maintain system baseline
- ~$4M RDT&E AoA for Follow-on System

2) Viper Generator sustainment issue
- ISEA (SSC-PAC) requires ~$.25M funding to conduct AoA

3) Software/Hardware issues
- PKE implementation required by April 2018
- New software implementation requirements coupled with aging hardware continue to result in unfunded costs to an under funded POR.

AN/UMQ-4(V)4 NAVAL INTEGRATED TACTICAL ENVIRONMENTAL SYSTEM – FIELDED (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 configured identical. 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 scheduled for 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&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; ensuring an information advantage over our adversaries and minimizing risk to mission, risk to force.

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 SUPORT (AGS) PLAN

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

TODAY'S EXPEDITIONARY AVIATION GROUND SUPPORT FORCE

The Marine Wing Support Squadron (MWSS) serves 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.*

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," as experienced in operations in Afghanistan and Iraq (OEF/OIF), 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 Wing Support Squadrons are meeting and 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.

Planning for the future of AGS continues with modernization of equipment, acquisition of new programs, updating training standards and reassessing of core mission essential tasks. Whether it be the reactivation of the Marine Wing Support Groups' HQ element; upgrading training opportunities; establishing alternative MOSs for AGS Weapons and Tactics Instructors; or developing 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 SUPORT (AGS) PLAN

MARINE WING SUPPORT GROUP

We believe that 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 initiative 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 to conduct 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 and two forward arming and refueling points simultaneously. FY 17 will see 8 active component MWSSs, an MWSS (-) and 3 reserve component MWSSs manned, trained and equipment for the future fight.

MARINE WING SUPPORT DETACHMENTS

Marine Wing Support Detachments are task organized to meet the AGS requirement of their supported MAG. They differ in size and capability. There are two standing MWSDs, though the capability to task organize from an MWSS is common practice.

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

Integration of an AGS training cell at MAGTF-Training Command Tactical Training and Exercise Control Group has been a success. **Four AGS Coyotes have been put in place to train and evaluate AGS units**. The AGS Coyote cell will ensure 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.

Over the next year training venues for MWSS will continue to 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
- Revise 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.
- Coordinate with MAGTF-TC to shape 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 SUPORT (AGS) PLAN

REMAINING RESPONSIVE AND RELEVANT AS AN AVIATION COMBAT MULTIPLIER

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 should be published this year. In addition, to accurately reflect the capabilities of an MWSS, the Mission Essential Task List was updated. The final step in fully updating AGS doctrine is to complete an MWSS Training and Readiness Manual review, which is currently scheduled for October 2017.

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 Debris cover, and rapid setting crater fill material.
3. **Creation of the AGS WTI MOS (7077).** This MOS will allow HQMC Aviation to track and then properly align Marines with the skillsets and knowledge required to plan and employ AGS units. This initiative will align the AGS Marines with students from MCLOG, MCTOG and others from MAWTS-1. This MOS has been approved and Marines will begin to receive the NMOS October 2017.
4. **Refinement of the AGS input and participation as a training unit** at service level exercises including WTI and ITX is imperative and an ongoing effort.
5. **Initial Capabilities Documents for EFR and EAF** have been completed that will lead to CDD development, based on community CBAs, that will potentially lead to material programs used to alleviate gaps within the EFR and EAF MOSs.

Further 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 Debris (FOD) is a hazard for aircraft operating at airfields and on AM2. In a deployed environment, it is imperative that the Marine Corps have the **capability to rapidly and safely remove FOD**. We are modernizing this capability.
4. **Training and readiness manual updates** will occur October 2017 and will incorporate the changes made to the MWSS and MWSD Mission Essential Task List.
5. **Marine Corps Tactical Publication (MCTP) 3-20B Aviation Ground Support is in final editing** and will be published in 2017.

AVIATION GROUND SUPPORT MATERIEL INITIATIVES

P-19R (P-19A REPLACEMENT) (FIELDING FY18-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.

1) The P-19A is the Marine Corps' only major aircraft fire fighting vehicle, and is used at Marine Corps air stations and forward operating bases for immediate response to aircraft emergencies (primary) and structural fires (secondary).
2) 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.
3) Equipment updates and enhancements will significantly enhance the ability of EFR Marines to fulfill their secondary mission by providing more effective base camp structural firefighting support.
4) The level of drivetrain and power-pack commonality (up to 75%) with current USMC tactical vehicles (MTVR and LVSR) will result in more efficient supply and maintenance supportability. Commercial-off-the-shelf (COTS) fire fighting components will increase parts availability and sustainability.
5) The addition of an Integral Auxiliary Power Unit (APU) will greatly reduce engine idle time during standby, resulting in increased fuel efficiency and engine longevity. The off road capability will **ensure support for operations in austere locations**--such as those supporting distributed short take-off/ vertical landing operations (DSO).

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

AVIATION GROUND SUPPORT MATERIEL INITIATIVES

EAF SUSTAINMENT LIGHTING SYSTEM (SLS) (FY20-FY21)

Current EAF hard-wire lighting system utilizes 1960-era technology, is maintenance intensive, and consistently encounters logistical challenges due to parts obsolescence.

1) SLS will fill a capability gap by providing mandatory runway lighting required for Category I, precision Instrument Flight Rules (IFR) approaches. This will serve to effectively integrate Air Traffic Control (ATC) and EAF capabilities to provide a **safer operational environment in degraded or reduced visibility** landing environments.

2) All available modern energy efficiency technology (Improved batteries, solar capability) will be leveraged to increase performance and sustainability. In addition, the new lighting system will be lighter, easily adaptable to various airfield configurations, and heat-resistant to support MV-22 and F-35 operations.

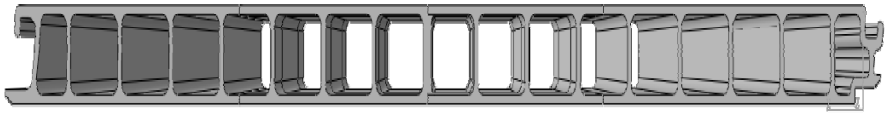
MARINE EXPEDITIONARY ENABLERS:
MARINE AIR COMMAND AND CONTROL SYSTEM (MACCS) AND AVIATION GROUND SUPORT (AGS) PLAN

AVIATION GROUND SUPPORT MATERIEL INITIATIVES

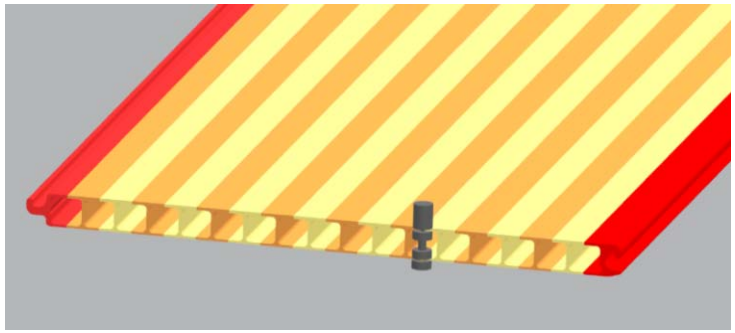
HEAT RESISTANT LIGHT-WEIGHT MATTING

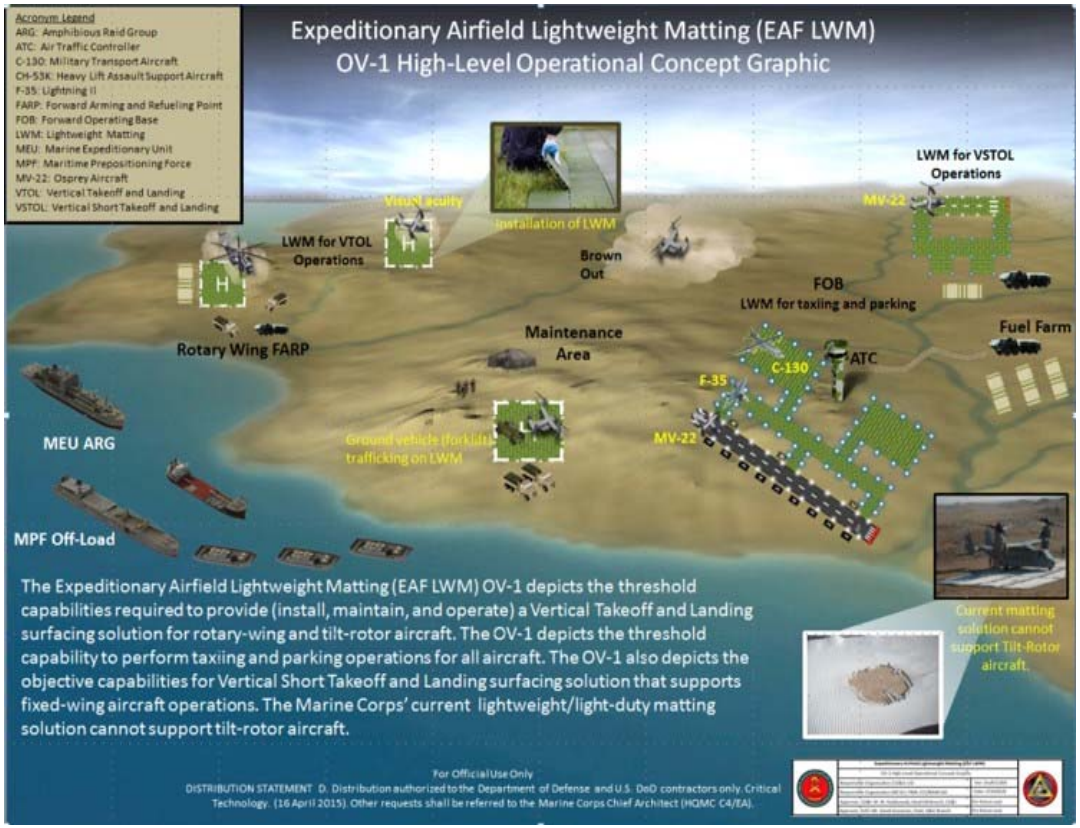
This initiative will develop and field, to the MWSS Expeditionary Airfield Platoon, a light-weight, light-duty matting solution with the threshold objective **of supporting MV-22 VTOL/VSTOL and the taxi and parking of fixed wing aircraft up to KC-130J**. The heat-resistant light-weight matting CDD will also contain the objective requirement to withstand F-35B VSTOL operations.

- University of Alabama
  - Metal solution
  - Two-piece core design



- Penn State University
  - Metal solution
  - Individual core extrusions





AVIATION GROUND SUPPORT MATERIEL INITIATIVES

Airfield Damage Repair

The Marine Corps requires an Airfield Damage Repair (ADR) Kit capable of creating useable landing surfaces by new construction or repair of existing surfaces. This mission has been repeatedly tested during recent operations in Afghanistan and Iraq. The ADR Kit must take advantage of modern developments in construction equipment and materials, must 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 Debris (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 AVIATION LOGISTICS PLAN

VALUE TO THE MAGTF

The Marine aviation logistics (AVLOG) community consists of the more than 39,000 Marines who serve in Military Occupational Specialties specializing in aircraft maintenance, aviation supply, aviation ordnance, avionics and aviation logistics information management systems. These Marines form the lifeblood of Marine aviation enabling the logistics activities required to ensure our squadrons are combat ready. These Marines work in our flying squadron maintenance departments, in the Marine Aviation Logistics Squadrons (MALS), and throughout the supporting establishments and commands that sustain and enable Marine aviation.

The ultimate goal of the AVLOG community is to produce healthy aircraft. Healthy aircraft provide a foundation for sustainable combat readiness. We are only able to generate and sustain healthy aircraft by building a health and effective maintenance base.

A ***healthy and effective maintenance base*** **is our center of gravity, and** serves as the first step-toward *healthy aircraft*. Operational squadrons draw strength from healthy aircraft; this is therefore what we most want to protect. Balanced operations and maintenance planning ensures healthy aircraft are viewed as a maintenance and operations goal which can only be achieved by leading and managing the healthy and effective maintenance base. When these conditions are achieved, an effective squadron training plan can be executed; sustained unit readiness (T-Rating) and a combat ready squadron will follow.

For example, the CH-53E reset program has set conditions for healthy aircraft and operations and maintenance balance. Reset aircraft have achieved a healthy condition, are easier to maintain, and provide far greater monthly flight hour generating capacity than they did prior to reset. These aircraft bring “predictable readiness” over time (for that aircraft) and normalize tempo, allowing maintenance departments to focus on fundamental elements of a healthy and effective maintenance base such as technical training and qualifications. These departments are investing improved human performance and saved time into maintaining Reset standards on Reset-complete aircraft and improving aircraft not yet reset.

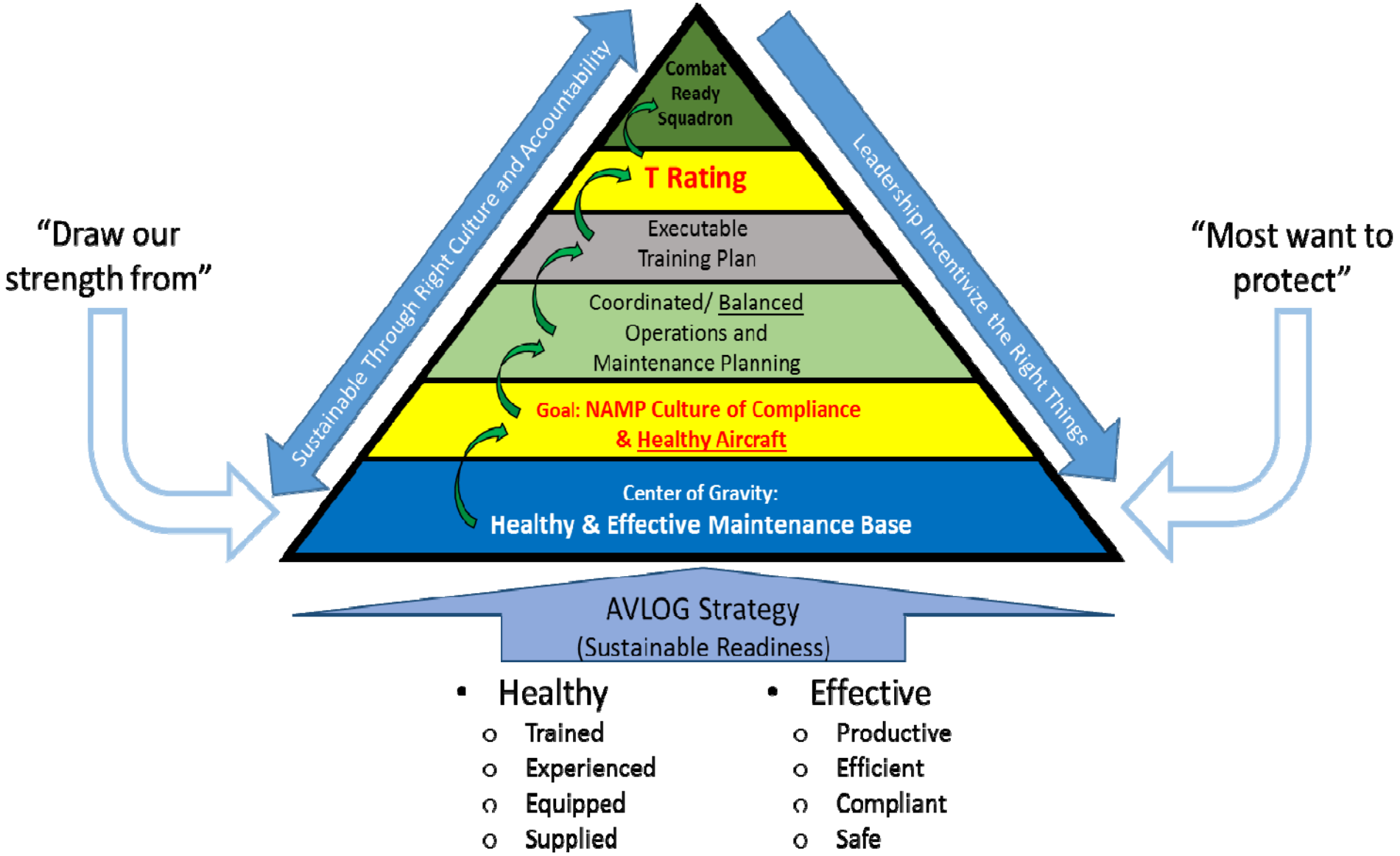
Additionally, by providing improved training for middle and upper level maintenance leaders and aviators, AVLOG will bridge the operations-maintenance divide to establish truly coordinated planning in order to drive more consistent and executable training plans and flight schedules

The purpose of the AVLOG Plan is to focus the community and Marine aviation on a strategy to guide investment with the goal of improving readiness of our Marines to do their individual jobs, our aircraft, and of the equipment required to sustain aviation operations. Key to this is improving the competency and abilities of each Marine. Our Independent Readiness Reviews indicate that Marines are working harder than ever in a resource constrained environment to create and sustain readiness.

Our Marines have met every challenge, but sixteen years of sustained combat operations and high deployment tempo combined with sequestration and force downsizing have taken a toll. To correct course, the AVLOG strategy provides a single aiming point for our combined efforts: creating a healthy and effective maintenance base. The maintenance base, as the center of gravity of our flying squadrons, is the thing we draw our strength from, and the thing we most want to protect.

Efforts to improve aviation readiness must focus first on setting the conditions required to develop and sustain *a healthy and effective maintenance base*. It is that foundation upon which aircraft and readiness and ultimately enduring aviation combat power is built.

This balance is essential for a squadron to write an executable training plan to achieve a T 2.0 training standard and a combat-ready squadron. The base is sustained by a right culture and accountability and by leadership incentivizing the right things. The **healthy and effective maintenance base means doing things the right way, every time.**


"Draw our strength from"
"Most want to protect"
Sustainable Through Right Culture and Accountability
Leadership Incentivize the Right Things
Combat Ready Squadron
T Rating
Executable Training Plan
Coordinated/ Balanced Operations and Maintenance Planning
Goal: NAMP Culture of Compliance & Healthy Aircraft
Center of Gravity:
Healthy & Effective Maintenance Base
AVLOG Strategy
(Sustainable Readiness)
Healthy
Trained
Experienced
Equipped
Supplied
Effective
Productive
Efficient
Compliant
Safe

MARINE AVIATION LOGISTICS PLAN

A ***healthy and effective maintenance base*** is described above. Utilizing the diagram and starting at the bottom: right numbers of Marines with the right qualifications perform and supervise maintenance operations and every maintenance program. These Marines are properly trained and provided the correct resources to do their jobs by the book. These well maintained, solid material condition aircraft are the prerequisite to realize coordinated and balanced operations and maintenance planning with more predictable readiness and aircraft grooming.

HEALTHY

TRAINED

We must provide a basis of understanding of the processes and techniques that will lead to effective maintenance, and proper maintenance program management. This includes all personnel from the squadron aircraft maintenance officer (AMO) to the newest mechanic. Existing efforts to professionalize the training continuum must achieve rapid dispersion to support all aviation units.

EXPERIENCED

We must manage talent to enable the best overall results by focusing on key capabilities. From supervising our maintenance-effort to developing new talent, we must employ a long-term vision of experience and talent management that shares today's best practices with tomorrow's leaders.

EQUIPPED

At the institutional level, we must ensure our Marines have the tools, equipment, and procedures that support their development and performance. This includes electronic publications, computer hardware, PPE, IMRL, and other items.

SUPPLIED

Marines must be provided the materials necessary to do their work in a timely manner. This focuses on aircraft parts and consumable materials.

EFFECTIVE

PRODUCTIVE

We must provide our workforce the time and freedom of maneuver to focus on aircraft maintenance actions that will improve aircraft readiness and material condition. Defining and publishing productivity standards will enable local decision makers to cause our Marines to focus on aircraft condition and deliver long-term readiness.

EFFICIENT

While management of limited resources continues to focus on material condition, we must also ensure today's effort delivers today's readiness to accompany tomorrows material condition. Efficient management of the effort must focus on both elements.

COMPLIANT

Naval aviation maintenance programs (NAMPs), policy letters, and local command procedures are all examples of efforts to share best-practices intended to lead to safe maintenance that is well documented and intended to reduce OVERALL workload. Embracing these policies is key to improving our professional development and performance. First among our efforts must be documentation accuracy because data drives top-level problem solving, and we must know what the real problems are.

SAFE

Our efforts must lead to providing safe and flyable aircraft to accomplish our mission.

IRRs have pointed out that at the squadron level, the **ops-maintenance balance is a problem. AVLOG is part of the solution.**

MARINE AVIATION LOGISTICS PLAN

Evidence of a healthy and effective maintenance base is well-maintained aircraft and a culture of compliance with the NAMP. Marines who are supported by their leadership when they do things "by the book" make fewer mistakes and develop a greater camaraderie for doing things the right way. Utilization of this strategy will result in aircraft that are not just better maintained, but aircraft with a lower likelihood of delayed preventative maintenance actions and failures resulting from "just make it work" repairs.

With well-maintained aircraft, maintenance leadership can be better prepared to engage in coordinated planning with the operations department. A better understanding between *equal planning partners* results in **neither side making unrealistic demands for flight hours or non-flying maintenance days.**

Balanced planning between operations requirements for sorties and maintenance requirements for scheduled and unscheduled maintenance allows for the development of realistic and executable training plans, one that guarantees minimum monthly flight hour requirements and long term FY flight hour goals without flying every available aircraft every day.

T2.0 can be achieved with the executable training plan, but just as importantly a squadron that has a healthy and effective maintenance base will pass maintenance inspections because programs are the effective safety measures they should be. Further, a combat ready squadron has both trained pilots and the up aircraft ready for them to fly, and fight with, tonight!

These goals cannot be successful without *accountability at all levels.* Group and squadron commanders must take ownership of their role as maintenance leaders. Failed inspections are a symptom of an unhealthy maintenance base. Inversely, a noteworthy inspection should receive the same praise and reward as achieving flight hour goals. Leadership must incentivize the right things and maintain a culture of compliance.

AVIATION LOGISTICS STRATEGY AND INNOVATION

As the Marine Corps welcomes its first 5th generation aircraft to the inventory, aviation logisticians are actively pursuing multiple capabilities to enable our maintenance Marines at all levels to keep pace to enable the highest level of material readiness in support of operations and training.

In the summer of 2017, HQMC Aviation established the Aviation Future Readiness and Innovation Working Group. In order to **avoid solving tomorrow's problems with yesterday's solutions**, this diverse group of ranks and MOSs is actively exploring various new technologies, and those already in use by industry, to improve how aviation logistics is conducted across the spectrum of operations.

In addition to the healthy and effective maintenance base, the aviation logistics (AVLOG) community will continue to develop and lead operational and strategic level initiatives to improve and sustain Marine aviation material readiness. Initiatives will modernize existing and time-tested AVLOG safety, training, and support strategies, as well as capitalize on emerging military industrial base.

Collectively, these efforts will enhance the ACE by improving the readiness (e.g. safety, effectiveness, reliability and availability) of Marine Corps aircraft, as well as improve the required depth and capacity of associated weapon systems, personnel and equipment.

FIFTH GENERATION MAINTAINER

Building standards and proponents for every maintainer across the fleet, regardless of location or T/M/S. Our ground counterparts know what a standard kit of equipment consists of and how they go to war. Our aviation maintenance Marines should have the same. This effort includes a full review of the standard kit of equipment that all maintainers receive and what they "bring to work" on a daily basis.

NEXT GENERATION AIRCRAFT MAINTENANCE TRAINING AIDS

Much like Marine Corps basic skills, aviation maintenance personnel require **a life-long learning philosophy** in order to develop and maintain a healthy and effective maintenance base. ASL continues to pursue advanced maintenance training aids that are rapidly adaptable, scalable, easily deployable, and cost effective. Current industry shifts and development towards virtual reality and augmented reality training and job aids represents a paradigm shift in training philosophy and meets the goals outlined for advanced next generation training aids. ASL will work with aircraft training stakeholders with the goal of facilitating an initial Collaborative Human Immersion Lab (CHIL) which will provide an operational virtual reality training system in FY19.

AUGMENTED AND VIRTUAL REALITY

Technology is ubiquitous throughout the aerospace industry. The use of augmented reality technology can assist maintainers with tasks and provide an environment where qualifications can be managed virtually, with less tolerance for human error. This technology is already commercially available at a cost that would pay for itself within the first few years of implementation.

ADDITIVE TECHNOLOGY, 3D PRINTING, AND INNOVATION

The Marine Corps is pursuing numerous technologies to include 3D printing, modern corrosion control, and dimensional restoration technologies to alleviate the burden on the supply system. This will enable us to use our time on assets that can't be fixed/produced locally and will give more capability to our commanders. This effort will include developing a more streamlined process for organizational- and intermediate- level activities and to pursue future innovation.

AVLOG TRAINING CENTER OF EXCELLENCE

Building on the success of the reestablishment of MATSG-23 as the first AVLOG-focused Colonel-level command in 2014, the **AVLOG Training Center of Excellence will be established at NAS Whiting Field, FL where all entry level AVLOG officer training will be conducted. In** addition to the current Maintenance and Ordnance Officer classes already being taught, the Naval Aviation Supply Basic Officer course relocated to Whiting Field in FY17, followed shortly by the establishment of the Avionics Officer and Avionics Chiefs Course. The relationships that start here, between these AVLOG leaders, will be integral in the future success of the AVLOG community in providing better support to Marine aviation.

AIRCRAFT MAINTENANCE CENTER OF EXCELLENCE AT MAWTS-1

The concept of MAWTS-1 as aviation subject matter experts and a repository for best practices is not new in the Marine Corps. The AVLOG community is **leveraging MAWTS as a repository for Marine aviation fleet-wide maintenance best practices.** The establishment of new training courses under the MAWTS-1 umbrella will provide improved and standardized training for all maintenance leaders across the fleet.

STANDARDIZATION OF PRE-MOS SCHOOL ON THE JOB TRAINING (OJT)

As a result of many MOS school exit interviews and the MOS curriculum working group, HQMC Aviation ASL branch worked with the 6002 monitor to ensure that starting in the summer of 2017**, every new lieutenant 6001 will complete a standardized OJT syllabus** at their assigned parent Marine Aviation Logistics Squadron between TBS and their formal MOS designating school. Utilizing a 10-week syllabus, the lieutenants will be exposed to AVLOG concepts, programs, and work centers based on the 1000 level T&R syllabus. This exposure exponentially increases their ability to absorb new information and apply critical thinking skills, both at Aircraft Maintenance Officer Course at NAS Whiting Field and in the fleet as division officers and maintenance material control officers (MMCOs).

ADVANCED AIRCRAFT MAINTENANCE OFFICERS COURSE (AAMOC)

The **advanced aircraft maintenance officer's course for 6002/6004/75XX has been established at MAWTS-1; the first class coincided with WTI 2-17**. Maintenance leaders were taught proven management techniques and exercised these techniques while managing the maintenance effort of WTI flight operations, resulting in unprecedented high readiness. Upcoming classes will include increased techniques and tools for NAMP Program Management.

AIRCRAFT MAINTENANCE ENGINEER OFFICERS COURSE

Investing in the training of our restricted officer community cannot be overlooked. Rather than rely on a re-introduction and familiarization to the NAMP, 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 than train 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.

AVIONICS OFFICER AND AVIONICS CHIEF COURSE

ASL, in conjunction with TECOM and CNATT, are in the process of **developing a curriculum and formal course for newly promoted Avionics Officers (AVOs) and Avionics Chiefs (AVCs) at the Master Sergeant Rank.** Currently in the front end analysis evaluation, the AVO/AVC course will addresses 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 AVIATION MANAGEMENT TRAINING (AAMT) COURSE

The AAMT course is being developed in conjunction with TECOM and will provide instruction to maintenance Staff Non-Commissioned Officers on how to develop long term maintenance, manpower, and materiel planning to improve aviation readiness focusing on four critical areas: maintenance management, manpower management, training management, and advanced skills management.

The challenge for the aviation maintenance manager is to ensure that the maintenance department is to provide safe, mission-capable aircraft to satisfy all mission requirements. The key to the manager's success is to consistently make the right decisions that will result in successful mission accomplishment. The focus is developing the skills to understanding aviation management and the complexities of operating an effective maintenance department.

ADVANCED WIRE REPAIR TRAINING

Declining material condition across every T/M/S is 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.

CNATT is currently in the process of a front end analysis evaluation 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 4th quarter of FY19.**

MAWTS-1 EXPEDITIONARY ORDNANCE COURSE (MEOC)

The expeditionary ordnance course was developed to train and educate 6531/6541/6591 fleet ordnance Marines on all new and emerging expeditionary aviation ordnance support tactics. This class is taught by MAWTS-1 in conjunction with each WTI class.

MAINTENANCE

AIRCRAFT ROTATION STRATEGY

HQMC Aviation will develop an aircraft rotation strategy which will **reduce the length of time aircraft are exposed to harsh environments like Okinawa, Hawaii, and forward deployed SPMAGTFs**. During the periods that these aircraft are in these type locations, their material condition deteriorates at an increased rate. Developing an Aircraft Rotation Strategy will help ensure balance between aircraft material condition and maintenance hours expended on transfer/acceptance inspections while preventing "additional work" such as CH-53E reset. Picking the correct aircraft to send to these locations will balance operational capabilities against logistics impacts, prevent overutilization and promote pride in ownership.

CONTRACT MAINTENANCE STRATEGY

Marine aviation requires a holistic and comprehensive contract maintenance support (CMS) Strategy. Too often CMS efforts are late to need, funding challenged, and being executed with undefined goals and life-spans. The CMS Strategy will move to consolidate efforts in order to codify best practices and reduce challenges by providing support to non-core capabilities such as post-depot rebuild evolutions and short-term experience gaps. CMS efforts will focus on emerging workload outside the designed scope, capability, and capacity of organizational level maintenance departments.

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, across all T/M/S. Steps such as the Advanced Wire Repair Course, are underway to correct deficiencies and train fleet personnel on proper procedures, however, there is no formal program that establishes training and maintenance standards for aircraft wiring systems.

In order to establish a healthy and effective maintenance base and to maintain gains 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, will be 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 (ATE) SUPPORT

The Marine Corps currently utilizes the Reconfigurable Transportable Consolidated Automated Support System (RTCASS) family of testers to diagnose and repair aircraft avionics components. RTCASS was originally designed for a 20 year life, and will reach that milestone in 2024. The Navy is currently in the process of transitioning their ATE to the eCASS family of testers at their shore sites and aboard CVN/L-Class ships. CVN conversion will begin in FY18 and L-Class conversion will begin in FY22. Additionally, eCASS is the most likely candidate to support F-35 intermediate level maintenance in the future. A test gap analysis is expected to be complete in early FY-18 and from there a business case will be prepared to help determine the way ahead.

ASL has submitted a requirements document to CNATT HQ to incorporate eCASS training into the existing RTCASS curriculum and will continue to evaluate the need and cost effectiveness of a full eCASS replacement of current ATE.

AVIATION ORDNANCE

The rapidly changing operational environment, combined with increased operational tempo, poses challenges for the ordnance community that are magnified by the pace of technology, end strength reductions and fiscal limitations. Creative responses are required to meet these challenges.

To that end, we will aggressively strive to improve the ordnance community through various measures such as TMS cross training and the strategic pairing of ordnance officers and chiefs. We will modernize Class V (A) support packages and maximize the efficient use of operational and maintenance funds in order to maintain existing weapons stocks and eliminate funding redundancies.

Further, we will communicate valid and clearly defined requirements to resource sponsors while remaining steadfast in advocating for modern logistics and automated IT solutions to improve the precision of ammunition accounting.

Finally, we will reduce Aviation Armament System (AAS) maintenance through increased Level III dynamic preservation capabilities and right sizing of the MAGs to reduce maintenance man-hours.
Together, these efforts will increase the depth and capacity of the Aviation Ordnance community and AVLOG support strategy.

ALIMS

In order to understand how resources are consumed and where demand originates, it is vital that organizational level aircraft maintenance documentation paint a complete and accurate picture.

A **renewed focus on 3M documentation at all levels is necessary to capture system and component level reliability, repair turnaround time, and man-hour consumption** at a very detailed level. Inaccurate information in these areas leads to 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.

We MUST ensure our Marines know that it is in their best interest to "tell the story the way it really happened" in the narrative AND the 3M codes of OOMA work orders and we must commit them to the 3M training necessary to deliver accurate results.

AVIATION SUPPLY

The focused efforts to improve the supply chain that supports Marine aviation have netted some important improvements. The FY17 AvPlan spelled out the intent to improve the way we organize spare parts at the tactical level to better support detachments and deployments. MARADMIN 175/16 announced the implementation of Marine Aviation Logistics Support Plan (MALSP) modernization allowancing methodology, which will help to optimize use of material resources at the tactical level and better support distributed operations. The implementation of MALSP modernization is a significant milestone for Marine aviation.

Another success is the increase from nine to fifteen AVLOG Marines at Defense Logistics Agency (DLA) Aviation in Richmond, including an aviation logistics Colonel. Management of demand signals and consumable materials will be a critical part of readiness recovery. Accordingly, the Marines assigned to DLA Richmond have been re-organized by T/M/S to better focus on providing support directly to Marine aviation.

The initiative to redesign the Aviation Supply Department (ASD) is being developed and tested in order to build cross functional skill-sets, recapitalize on 6672 structure for emerging requirements, create a more competitive enlisted environment and reduce process function redundancies by consolidating the ASD functions into three divisions. The ASD redesign is planned for full implementation in 2018.

We are attacking our current unacceptable NMCS rate and root causes. We have combined efforts with NAVSUP and DLA on the continued roll-out of the Mission Essential Sub-System Matrix (MESM) Strategy for the H-1, CH-53E, and T-64 engine consumables with low or infrequent demand patterns.

Each of the IRRs conducted to date (AV-8B, CH-53E, V-22 and H-1) identified **systematic shortfalls in the sustainment organizations, processes, and resources** of the supply chain that supports Marine aviation. Accordingly, the focus of effort in FY18 and beyond will be on continuing to aggressively attack these daunting challenges.

In 2018 we will capitalize on feedback from the V-22 IRR by implementing the Customer Optimized Leveling Technique (COLT) and Proactive Demand Leveling (PDL) tools. COLT sets retail stock levels for consumable items using multi-echelon inventory algorithms that account for the projected performance at the wholesale level.

COLT seeks to minimize customer wait time for a given level of investment and adapts to this information by stocking more spares at the base for items which DLA is projecting poor support and stocking fewer spares for items for which DLA is projecting strong support. PDL uses a set of business rules to process demand data from bases 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.

OPLAN SUPPORT AND MAGTF LOGISTICS INTEGRATION

TAVB

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.** Traditionally an aviation asset, recent logistics integration opportunities and exercises performed in conjunction with Combat Logistics Regiments have expanded the capability and potential of the ship.

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. With a continued eye towards capability expansion, both T-AVB ship flight decks will be certified for the MV-22 by the end of 1st quarter FY 18. 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.

MAGTF LOGISTICS INTEGRATION

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 DC, I&L include improved distribution methods and tracking, shared technology development efforts, and more integrated enterprise-level processes.

SUMMARY

Starting with a healthy and effective maintenance base, the AVLOG community is focusing their efforts and initiatives on building the prerequisite conditions to support T2.0 and fully combat ready squadrons. All current and future initiatives within the AVLOG community are targeted to support and energize the aircraft maintenance department, the *center of gravity* of every flying squadron.

As Marines we accept challenges before us, head on, and seek creative solutions to them. Outlined above are only a handful of the current initiatives and projects being spearheaded or tracked by ASL. There are many other projects in their infancies: **maintainer exchanges with civilian airlines; wireless connectivity on the flight lines; adding increased maintenance officer structure**. As a forward looking force, we must constantly ask ourselves, not only how our performance is measuring up today, but how can we improve in the future and set up the Marines of tomorrow for success? We must maintain strategic patience to allow our success to develop.

Though the benefits of many initiatives may not manifest tomorrow, they will provide exponential returns in the long run and ensure our ability to not only recover our readiness, but sustain our gains indefinitely.

By focusing on the **healthy and effective maintenance base**, Marine aviation is building a solid foundation for the future and investing in the human capital side of the ledger. Every initiative, project, and training curriculum feeds into the ultimate goal of a combat ready squadron, one that has both trained pilots and aircraft ready for them to fly, and fight, tonight.

MARINE AVIATION WEAPONS AND TACTICS SQUADRON ONE

The origin of MAWTS-1 may be traced to 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 assists 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&E) department. ADT&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 possesses 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. 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&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 HIMARS use, Patriot defense, CAC2S, G/ATOR, F-35 DSO, and ordnance such as TALD and APKWS.

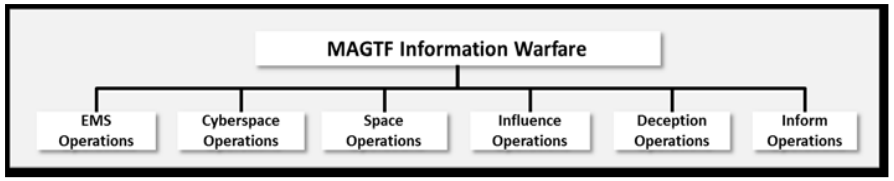
MARINE AVIATION WEAPONS AND TACTICS SQUADRON ONE

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, 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.

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.

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 AVIATION WEAPONS AND TACTICS SQUADRON ONE

While WTI evolves and there are many new and different aspects of the course, the focus of the syllabus remains the **production of world-class tacticians capable of leading full-spectrum MAGTF operations**. MAWTS-1 is the aviation weapons school of the Marine Corps, dedicated to meeting the needs of the operating forces under any conditions.

We continue to produce innovative WTI graduates who are familiar with the latest cutting-edge technology and capable of integrating across the MAGTF. Ultimately, the goal is to continue to produce WTI graduates who are well-prepared to lead unit training, manage risk, and integrate with joint and coalition forces to win our nation's battles.

MARINE OPERATIONAL TEST AND EVALUATION SQUADRON ONE

2003

VMX-22 Established at MCAS New River as Marine Tiltrotor Operational Test & Evaluation Squadron 22 with the mission of conducting initial operational test & evaluation (IOT&E) of the MV-22

2009

Assumed CH-53E Operational Test & Evaluation mission from HMX-1, remainder of CH-53E test mission transferred from HX-21 in April 2014

2010

F-35 Detachment Established at Edwards AFB, first F-35B aircraft delivered October 2014

2013

Unmanned Aerial Systems (**UAS**) **and** Command, Control, & Communications (**C3**) **Departments Established**

2015

Headquarters and MV-22 Test Team transferred from MCAS New River to MCAS Yuma

Light Attack (UH-1 / AH-1) OT&E Transferred from VX-9

2016

VMX-1 Redesignation, S&T Department Established

MARINE OPERATIONAL TEST AND EVALUATION SQUADRON ONE

SQUADRON HISTORY

In 2003, VMX-22 was established at MCAS New River as Marine Tiltrotor Operational Test & Evaluation Squadron 22 with the mission of conducting IOT&E of the MV-22. In 2009, VMX-22 assumed the CH-53E Operational Test & Evaluation (OT&E) mission from HMX-1. The remainder of the CH-53E test mission transferred from HX-21 in April 2014. In 2010, the F-35 detachment was established at Edwards AFB. The first F-35B aircraft was delivered in October 2014. In 2013, Unmanned Aerial Systems (UAS) and Command, Control, & Communications (C3) departments were established.

In 2015, VMX-22 Headquarters and MV-22 Test Team transferred from MCAS New River to MCAS Yuma. Light Attack (UH-1 / AH-1) OT&E transferred to VMX-22 from VX-9.

In 2016, VMX-22 was re-designated as Marine Operational Test and Evaluation Squadron One (VMX-1) and the Science and Technology (S&T) Department was established.

MISSION

Conduct operational test and evaluation of all 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 (TTP). Coordinate and conduct government sponsored experimentation and tactical demonstrations. Provide additional operational support as directed by Deputy Commandant for Aviation.

OVERVIEW

VMX-1 has continued the development and growth of operational testing conduct and has led the way for future Marine Corps entities by conducting operational testing, educating the fleet on new equipment and TTPs, and innovating. These innovations include tactical and technical demonstrations as well as S&T ties with federally funded research laboratories. The squadron underwent an overhaul of its mission statement which evolved to include a role in science and technology, unmanned platforms, and aviation command and control (C2) systems. 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 with the needs of today's warfighter and able to anticipate the needs of the future.

F-35B TEST TEAM

VMX-1 Det Edwards continues testing on four F-35B Lightning II aircraft. As part of the Joint Strike Fighter Operational Test Team (JOTT) at Edwards AFB, the detachment continues to train and receive aircraft modifications required for IOT&E of the F-35B. The detachment will expand to 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.

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 focus in 2016 and the first half of 2017 was providing support to MCOTEA's Common Aviation Command and Control System (CAC2S) Phase 2 integrated and operational test events to include building the cumulative training event for the initial fielding of that system in the 3rd and 4th quarters of FY17. C3 also provided OT&E planning support to MCOTEA for G/ATOR Block 1, and Command and Control Air Operations Suite – Command and Control Information Services (C2AOS-C2IS) developmental test (DT) assistance.

In addition to test support, C3 supported concept and TTP development for Counter-Small UAS projects, Integrated Fire Control (IFC) events and exercises, as well as development and refinement of the Tactical Air Control Element (TACE) concept, a potential future replacement for the Marine Air Control Group MEU Detachment—to that end, the department acquired four MRZR-D4 utility tactical vehicles (UTV) to serve as the platform for the TACE concept demonstration.

The Department's activities for the remainder of FY17 and into FY18 will primarily focus on OT&E and DT assistance as well as TACE concept refinement and demonstration. FY17 and FY18 Department Focus Areas outside of test support are USMC/naval integration ashore and afloat, Counter-UAS, MAGTF Digital Interoperability, and MACCS role in IFC.

CH-53

VMX-1's CH-53E/K Detachment is stationed at MCAS New River with three CH-53Es and will add one or two CH-53Ks during FY18. The detachment supports various operational and developmental test efforts. FY18 Operational Test efforts will include MAGTF Agile Network Gateway Link (MANGL) which will establish a Digital Interoperability link to the MAGTF. Developmental testing of the #2 Engine Backflow Duct Installation and Instrumentation, in NAS Patuxent River, MD and MCAS New River, NC will continue through FY18.

The detachment will also be prepared to assist in the SpaceX Dragon Drop which will test the spacecraft's reentry capabilities. Additionally, the CH-53 Division supports the validation and certification of external and internal cargo. VMX-1 is supporting, and will continue to support, the development of the CH-53K by participating in integrated testing at Sikorsky's West Palm Beach, FL facility and NAS Patuxent River, MD.

VMX-1 has identified the "core four" pilots who will receive Pilot-in-Command designations in the CH-53K during FY18. These pilots, and designated aircrew, will assist in the training and standup of our first CH-53K fleet squadron in MCAS New River.

Once the CH-53K fleet introduction 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.

MARINE OPERATIONAL TEST AND EVALUATION SQUADRON ONE

H-1

Two AH-1Zs, three UH-1Ys, and two AH-1Ws reside at VMX-1 headquarters as operational testing aircraft.

In 2016, VMX-1 conducted a Quick Reaction Assessment of the Intrepid Tiger II (V)3 pod in support of the Rapid Deployment Capability on the UH-1Y and in 2017 conducted testing for the Joint Service Aircrew Mask.

Future tests include software upgrades, an improved Advanced Precision Kill Weapon System (APKWS) warhead with penetration capability, Digital Interoperability - Full Motion Video testing, upgrades to aircraft survivability equipment, the Joint Air-to-Ground Missile (JAGM), and further testing of the Intrepid Tiger II (V)3 pod.

MV-22

Operational testing continues for the Department of the Navy Large Aircraft Infrared Counter Measure (DoN LAIRCM) Advanced Threat Warner (ATW) system. Testing was conducted from late-2015 through 2016 in order to assess the performance of this new RADAR and missile defense system. Concurrent operational test included follow-on live-fire testing of the GAU-21 Ramp Mounted Weapon System (RMWS) and the belly-mounted Defensive Weapon System (DWS).

ATW testing continued into 2017 as part of both urgent universal needs statement (UUNS) and joint universal operational needs statement (JUONS) requirements, incorporating an updated RADAR warning system, with the MV-22B chosen as the lead platform for the APR-39D(v)2 testing. Testing in 2016 concluded with VMX-1 as lead in support of the Navy's Fleet Battle Experiment (FBE), which examined the logistical footprint required for future Navy CMV-22s as they replace the aging COD C-2 Greyhound aircraft.

Improvements to the MV-22Bs navigation FLIR included an in-depth assessment of multiple EO/IR targeting sensor upgrades. Future capability growth will include the ability to off-board ATW threat data via a growing suite of digital interoperability capabilities, as well as refinement of organic defensive weapons capabilities.

V-22 Aerial Refueling System (VARS) and distributed short take-off and vertical landing (STOVL) operations will continue to be developed and refined throughout 2017 and beyond.

MARINE OPERATIONAL TEST AND EVALUATION SQUADRON ONE

UAS

Following the Full Rate Production decision on the RQ-21, VMX-1 is conducting detailed test planning for Follow-On Operational Test and Evaluation (FOT&E). This period of testing will evaluate several capability enhancements for the RQ-21, to include improved electro-optical (EO) and infrared (IR) sensors, a laser target designator, an electronic warfare/signals intelligence (EW/SIGINT) payload, a synthetic aperture radar imaging payload, and a new encrypted digital data link. With successful evaluations, these enhancements will expand the capabilities of the VMU detachment within a MAGTF of any scale.

To further increase the utility of medium-sized UASs, VMX-1 will conduct a series of experiments with the ground control segment. One desired outcome is to become more expeditionary through footprint reductions and standardized universal ground control stations. A second desired outcome is to increase the digital interoperability between the RQ-21 (and other current/future UAS) and currently-fielded information systems.

By formalizing the hardware and software components of the RQ-21 digital dissemination, the unmanned aerial vehicle (VMU) detachment can vastly improve its ability to disseminate information across multiple networks. This can positively impact intelligence collection, fires, battlespace awareness, and communications.

Looking toward the future, the Marine Unmanned Expeditionary (MUX) Capabilities Document continues to undergo refinements. In order to inform requirements, VMX-1 will be supporting a series of experiments and demonstrations to ensure the MUX solution will meet current and future needs. To this end, the KMAX unmanned

cargo UAS will once again take flight. This will reeducate the MAGTF on the potential of unmanned cargo delivery and will aid the requirements officers in generating meaningful requirements for the Marine Corps' next large unmanned investment.

MARINE OPERATIONAL TEST AND EVALUATION SQUADRON ONE

CH-53K DT/OT

IASE / DON LAIRCM

F-35B LHD DT-3

INTREPID TIGER 2
JAGM & FMV

MV-22B CVN
FLEET BATTLE EXPERIMENT

DIGITAL INTEROPERABILITY / PERDIX
MICRO-UAS

MARINE HELICOPTER SQUADRON ONE

HMX-1's missions include the worldwide transportation for the President of the United States, transportation within the National Capital Region of 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.

The first step was divesting of their heavy lift aircraft and transitioning to an all CH-46E support element. Executed in less than nine months, this move provided much needed CH-53E assets to the fleet while posturing the squadron for their own MV-22B transition.

In FY13 HMX-1 began the one year transition from CH-46E to the MV-22B, which was completed during the 4th Qtr FY14 providing HMX-1 with 12 MV-22B aircraft for presidential support.

The next component of the HMX-1 transformation is the Presidential Helicopter Replacement Program (VH-92A). **The VH-92A will replace both the VH-3D and VH-60N aircraf**t. 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.

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.

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, and Cabinet officials.

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 planned 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, communications upgrades, and upgrading the VH-60N to the 401C engine to improve high altitude performance.

UPGRADES

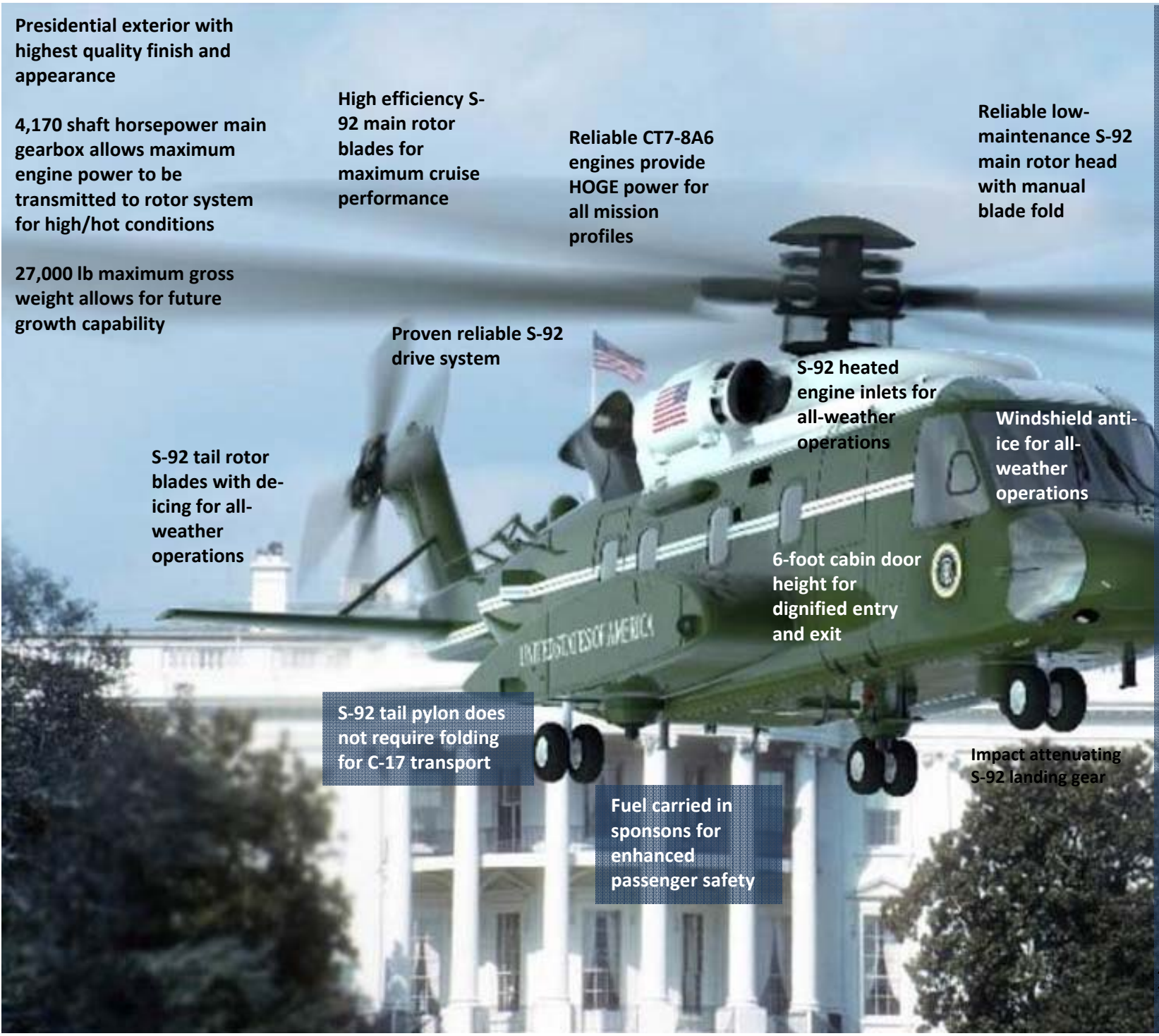
VH-3D

- Weight reduction program
- Abbreviated Cockpit Upgrade Program
  - 1st install FY16
- Wide Band Line of Sight IOC 2017
- Service Life Extension Program

VH-60N

- 401C engine upgrade
  - Completed FY16
- Service Life Extension Program (FY17)
- Wide Band Line of Sight
  - IOC 2017

VH-92A PRESIDENTIAL HELICOPTER



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 PAA: VH-3D x 11
VH-60N X 8
MV-22B X 12
UH-3D X 1
UH-60N X 1

FORCE GOAL PAA: VH-92A X 21
MV-22B X 12

		FY18				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	1	2	3	4
UNIT/LOCATION	PAA																																											
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																											
	12 x MV-22B																																											

H = AIRCRAFT TRANSITION BEGINS
X = AIRCRAFT TRANSITION COMPLETE

D = AIRCRAFT DIVESTING

AIRCRAFT TYPE/PAA	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28
VH-3D	11	11	8	8	5	0	0	0	0	0	0
VH-60N	8	8	8	6	6	0	0	0	0	0	0
VH-92A	0	3	4	8	15	21	21	21	21	21	21
UH-3D	1	1	1	1	0	0	0	0	0	0	0
UH-60N	1	1	1	1	1	0	0	0	0	0	0
MV-22B	12	12	12	12	12	12	12	2	12	12	12
TOTAL HMX-1 PAA	**33**	**36**	**34**	**36**	**39**	**33**	**33**	**23**	**33**	**33**	**33**

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

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. Examples include participation in Exercises Ulchi Freedom Guardian, Key Resolve, RIMPAC, Valiant Shield, and Cold Response.

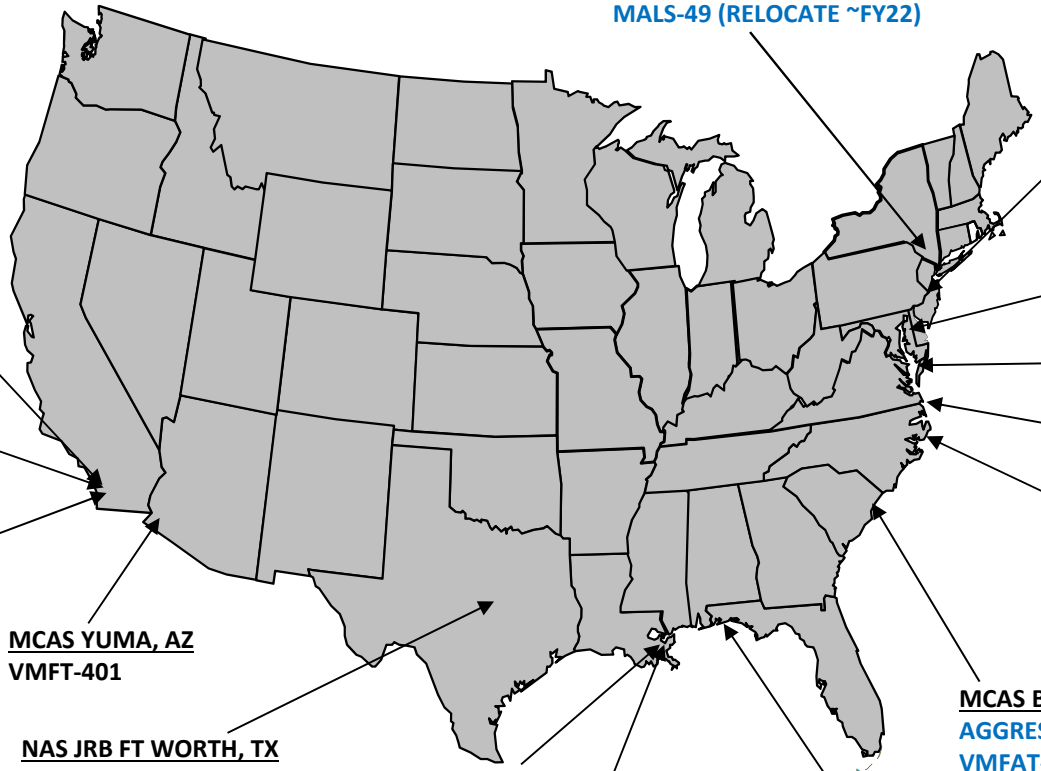
Unit Deployment Program: 4th MAW supports the Unit Deployment Program by providing OPTEMPO relief for the active component as required.

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. In addition, 4th MAW augments and reinforces USMC Fleet Replacement Squadrons, Naval Aviation training command, HMX-1 and VMX-1 through MATSG-42 Squadron Augmentation Units.

Force Augmentation: 4th MAW provides highly-qualified individual battle staff officers to augment and reinforce JTF, MARFOR, MEF, MEB, and MEU command elements in support of exercises and contingencies. In addition, 4th MAW aviators support Fleet Replacement Squadrons, HMX-1, and VMX-1 through Squadron Augmentation Units (SAU).

4TH MAW GROUP, SQUADRON, AND MALS LAYDOWN



STEWART ANGB, NY
VMGR-452 (RELOCATE ~FY21)
MALS-49 (RELOCATE ~FY22)

JB McGUIRE-DIX-LAKEHURST (JB MDL)
MAG-49 HQ
HMLA-773
HMH-772 (-)
MALS-49 DET A (ACTIVATE FY18)

JB ANDREWS, MD
VMR Det ANDREWS

MCB QUANTICO, VA
HMX-1 SAU

NS NORFOLK, VA
VMM-774
MALS-49 DET B (ACTIVATE FY18)

MCAS CHERRY PT, NC
VMAT-203 SAU

MCAS BEAUFORT, SC
AGGRESSOR DET (TBD)
VMFAT-501 SAU (ESTABLISH FY18)

NAS PENSACOLA, FL
MATSG-42 HQ

NEW ORLEANS, LA
4TH MAW HQ

NAS JRB NEW ORLEANS, LA
HMLA-773 DET A
VMR DET BELLE CHASE
MALS-49 DET C (ACTIVATE FY18)

NAS JRB FT WORTH, TX
MAG-41 HQ
VMFA-112
VMGR-234
MALS-41
VMR-1 (REALIGN FY18)

MCAS YUMA, AZ
VMFT-401

MCAS MIRAMAR, CA
VMM-764
SITE SUPPORT MIRAMAR
VMFAT-101 SAU
MALS-41 DET A (ACTIVATE FY18)
VMFA-134 (ACTIVATE FY30)

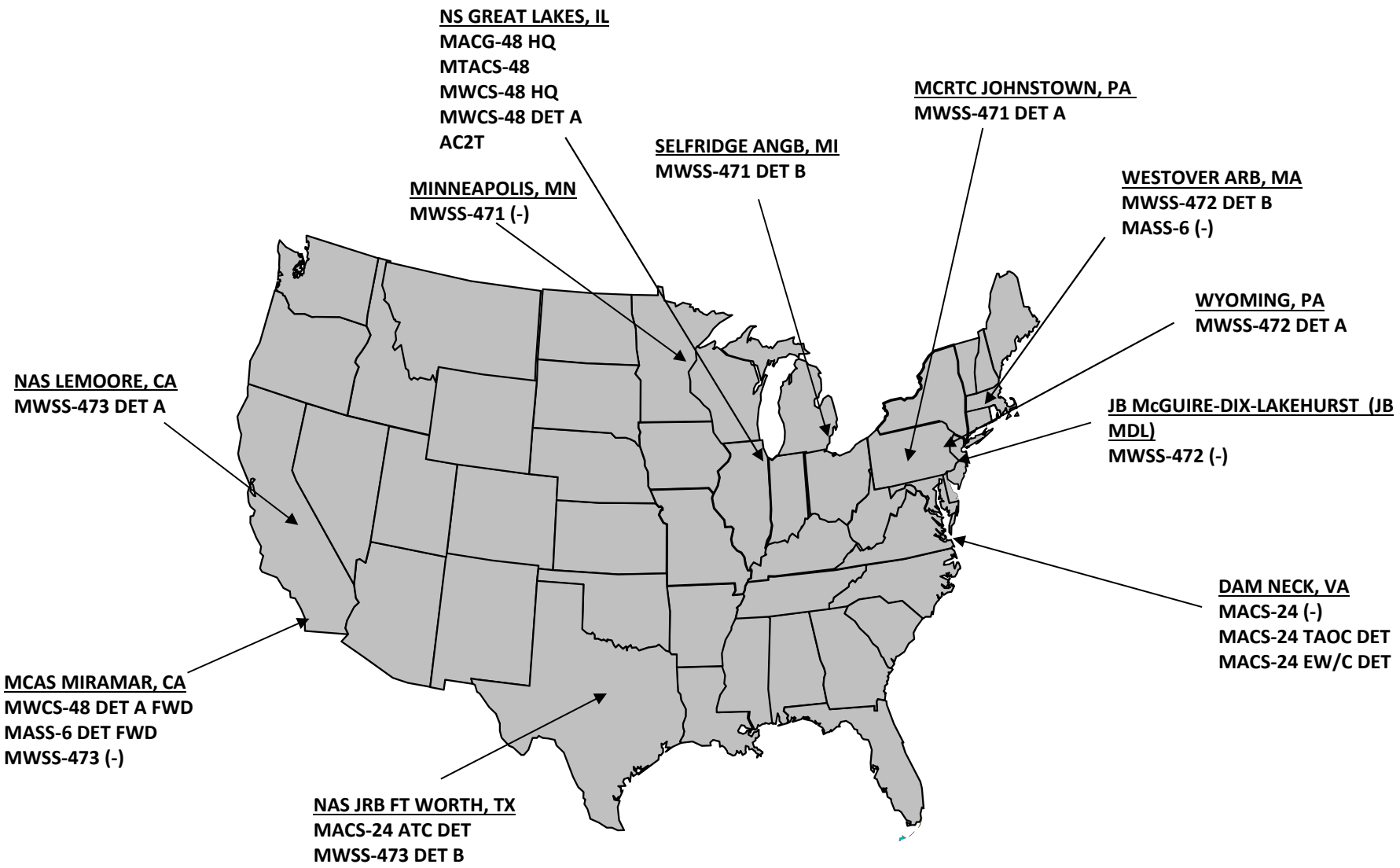
MCAS CAMP PENDLETON, CA
HMLA-775 (-)
HMLAT-303 SAU
MALS-41 DET B (ACTIVATE FY18)

MCB CAMP PENDLETON, CA
VMU-4 (-)

Location TBD
VMU-5 (-) (~FY26)

BLACK = Current Laydown
Blue = Restructuring FY18+

4TH MAW MACG AND MWSS LAYDOWN



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. As specially certified and qualified service members and aviators who, 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), the 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 and refresher 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 JTACs and 262 FACs for a total of 606 ground-based controllers**.

This need translates to a requirement to produce 220 JTACs annually (equal to roughly maximum capacity for EWTGPAC and LANT when fully supported with all required external assets). 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 with expectations that the total requirement will increase again.

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 and 1803
Primary enlisted feeder MOSs are 0861 and 0321.
Must be E-5 and above.
All these MOSs are listed on Unit TO&Es with a billet MOS of 8002.

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**.

Testing and evaluation into the validity of the 7315 PMOS to augment 75XX aviators as 7502 is underway currently.

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."

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.

USMC FAC(A) Platforms: AH-1, UH-1, F/A-18, AV-8, F-35

MARINE TACTICAL AIR CONTROL PARTY

WEAPONS AND TACTICS INSTRUCTOR (WTI, MOS 8077)

Formerly the Tactical Air Control Party Instructor (TACP(I)).

A **SNCO or officer graduate of the MAWTS-1 Weapons and Tactics Instructor Course**.

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 a 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)	36
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**	**78**

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)
HMLA	7 HMLA 3 x W/Y 4 x Y/Z	8 x H-1W 6 x H-1Z 4 x H-1Y	76
VMFA(AW)	4 Sqdn	6 FAC(A) crews per Sqdn	24
VMFA	9 Sqdn	2 FAC(A) per Sqdn	18
VMA	5 Sqdn	2 FAC(A) per Sqdn	10
		TOTAL	**128**

Total TAC: 734 (578 AC / 156 RC)

MARINE TACTICAL AIR CONTROL PARTY

TARGET HANDOFF SYSTEM (THS)

THS is in the process of refreshing hardware and software to enable an increase in capability with the SLATE (Smaller Lighter Ancillary TLDHS Equipment) kit and Strikelink software version 1.2, with the goal of providing a better user interface. This capability will be replaced in 2017 by THSv2, which incorporates the Marine Fires Application, a combination of KILSWITCH and the Army's MAFIA application. THS has also assumed responsibility for the hand-held video downlink requirement and **began fielding this capability in FY 2013** with the Soldier ISR Receiver (SIR) versions 2.0 and 2.5.

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.**

PORTABLE LASER DESIGNATOR RANGEFINDER (PLDR)

The PLDR replaced the interim laser designator, the Ground Laser Target Designator 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.

In October 2011, The Joint Terminal Attack Controller Lightweight Target Designator (JTAC-LTD) was fielded in response to an UUNS**. 150 systems have been fielded.**

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.**

THERMAL IMAGER

The Kollsman Long Range Thermal Imager provides the FAC/JTAC a long range target location capability for both day and night operations. **Fielding to the operating forces 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 AAO of 384 systems.

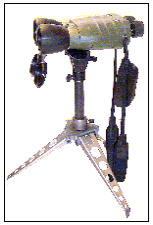
MARINE TACTICAL AIR CONTROL PARTY

TACP FOS PRESENT

MPVDL
SIR 2.0/2.5

PRC-117F

THS:
MRT-B and
SLATE w/
Strikelink 1.2



CLRF IC

TLSI

JTAC-LTD

TACP FOS FUTURE *

PRC-152/A
PRC-117F/G

SIR 2.5

End User Device x 2
Select Mode Protective
Case

CLRF-IC

Taclink Modem

7 Port Hub

SAASM GPS Puck

Revision Battery X 2

Revision Battery
Charger

152 Battery Adapter

BB5590/2590 Adapter

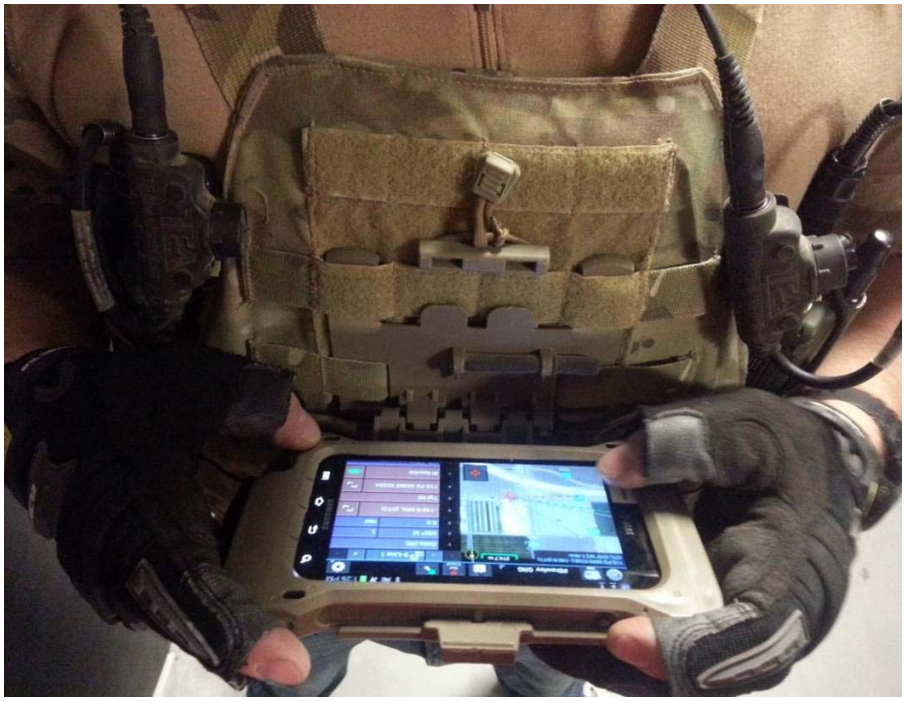
- The Marine Corps continues to evaluate systems and to equip TACPs to this end state. Increased PRC-117G and SIR 2.5 AAOs will help ensure systems critical link in the digitally interoperable MAGTF are fielded to the lowest levels for training and execution;
- All systems should seek to integrate with joint and airborne systems such as SRP to enable full end-user interface and capability.

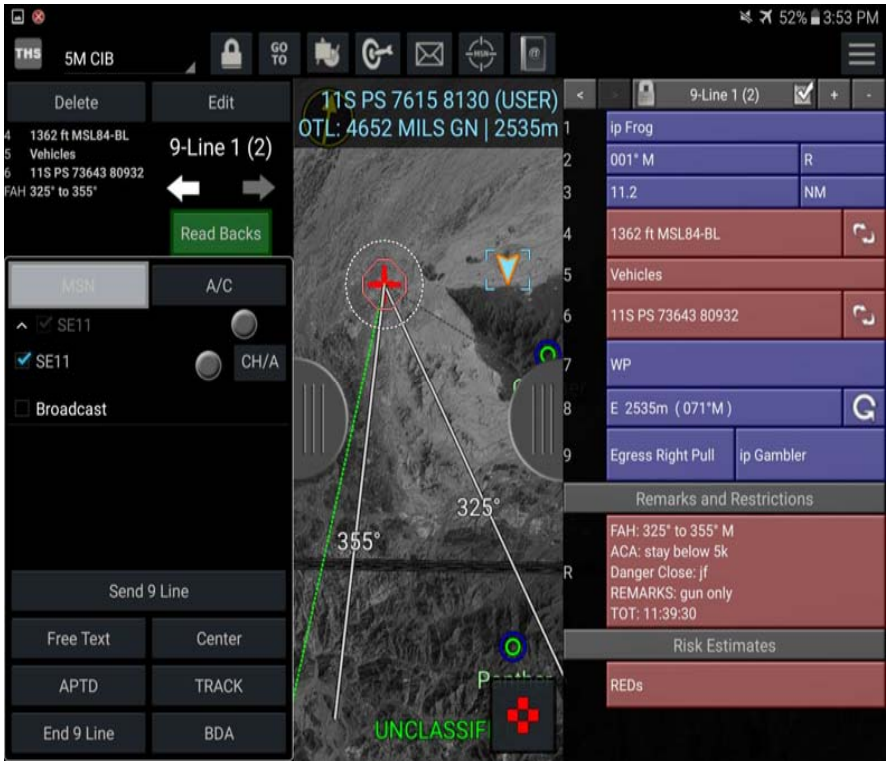
MARINE TACTICAL AIR CONTROL PARTY

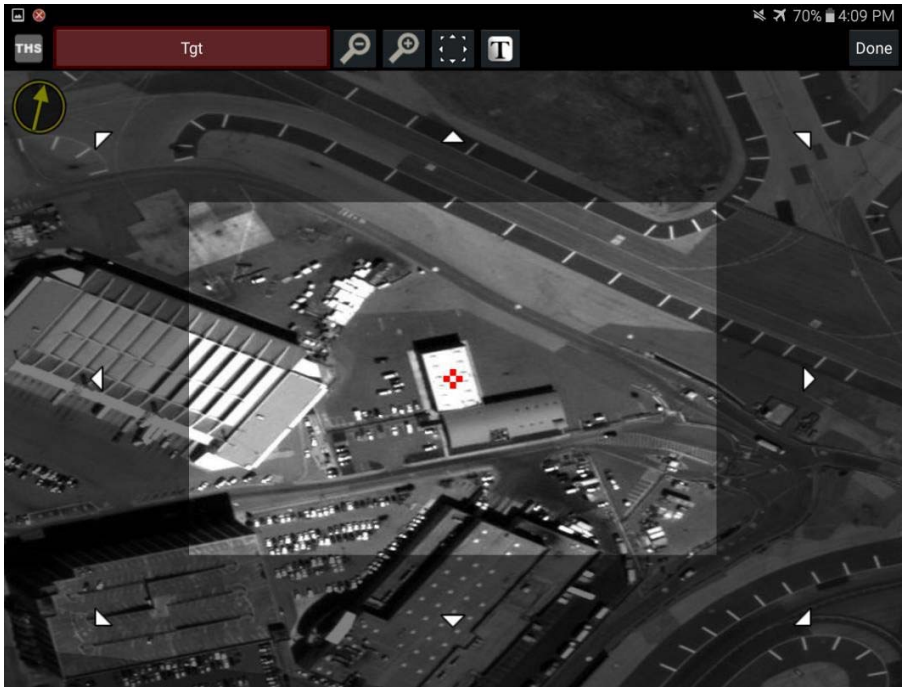
TACP AND TABLETS

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.

Initial fielding of THSv2 will provide the warfighter with VMF DACAS/Fires capability, with Link-16 and Net Enabled Weapon interoperability planned in future software upgrades.







MARINE AVIATION WEAPONS AND MUNITIONS PLAN

MISSION

Marine aviation will continue to develop and procure weapon systems that will increase lethality and survivability for the warfighter. Our focus of effort is to pace enhancements in the USMC weapons portfolio with platform advances by leveraging technology in order to achieve precision, discrimination, lower weight, increased kills per sortie, and commonality where appropriate.

Investment in weapons requirements for the future must leverage **modular classes of weapons** in order to support operations ranging from crisis response to major combat operations. With their inherent smaller logistical footprint, tailorability and effects dialability, modular weapons more efficiently support EAB operations, distributed forces, and a resilient network for precise fires. Weapons modularity will permit the flexibility required to support the combatant commander's distributed forces with tactical flexibility.

ROCKETS

APKWS II has completed a Rapid Deployment Capability on AV-8B and was the first TACAIR platform to integrate the weapon. The AV-8B has demonstrated a greater than 90% hit probability both in training and in support of combat operations during Operations INHERENT RESOLVE and ODYSSEY LIGHTNING.

APKWS II integrated with the M282 Multi-Purpose Penetrator (MPP) warhead is a low-cost PGM capable of defeating light-armored vehicles and hardened structures.

The M282 MPP warhead is a 2.75-inch 13.7 pound penetrating and incendiary warhead delivering penetration (40” reinforced concrete or 1” of steel), blast (over 1500 fragments), and incendiary effects (2000˚F due to zirconium). APKWS II’s 90% hit rate, coupled with the M282 MPP warhead will provide a lower yield and lower cost precision weapon for attacking targets otherwise serviced by Hellfire missiles, Laser guided bombs, or Laser Maverick with more stowed-kills per sortie.

HQMC anticipates M282 IOC on AH-1Z and UH-1Y in March 2018.

Marine aviation will continue to leverage APKWS II success with integration on F/A-18 completed by April 2018.

MISSILES

To address TACAIR's operational need for additional forward-firing missiles, the remainder of legacy AGM-65F Infrared (IR) Mavericks are being converted into modernized AGM-65E2 Laser Mavericks. These conversions will nearly double the current inventory of Laser Mavericks. The AGM-65E2 seeker provides F/A-18 and AV-8B with increased self-designation capability, greater chance of laser spot re-acquisition if lost due to obscurants, and a more accurate laser spot scan than the AGM-65E seeker.

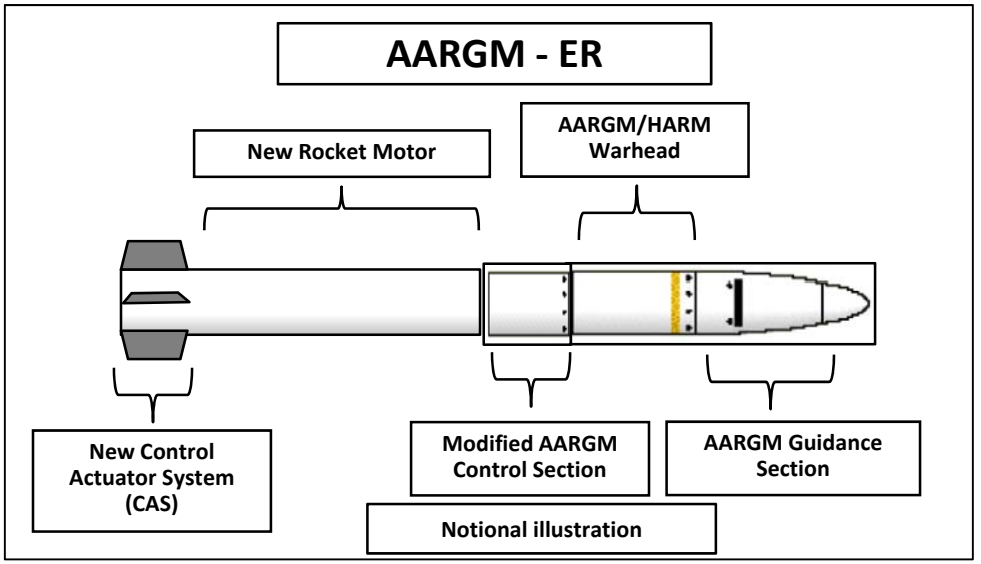
The **AIM-9X Block II Sidewinder** adds a lock-on-after-launch capability with data link, allowing it to be launched and then guided to a target for 360 degree engagements. The Block II+ variant will be fielded in FY19 to support F-35B/C.

AIM-9X

Advanced Anti-Radiation Guided Missile – Extended Range (AARGM-ER) will incorporate a new rocket motor onto AARGM in order to improve range and survivability. AARGM-ER is fully-funded for F/A-18E/F and IOC is expected in FY23, with F-35B/C objective platforms.

The AIM-120 Advanced Medium Range Air-to-Air Missile (AMRAAM) allows 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 will provide further refinements through the inclusion of an internal GPS, an enhanced two-way data link, improved software, and improved range and speed.

AIM-120D



MARINE AVIATION WEAPONS AND MUNITIONS PLAN

The **Joint Air-Ground Missile (JAGM)** program is fully funded and passed the Milestone B Defense Acquisition Board. Engineering and manufacturing and development phase live fire missile shots have begun in FY17.

JAGM incorporates a dual-mode semi-active laser (SAL) and millimeter wave (MMW) seeker with a multi-mode fuze (height of burst, delay, and point detonate). The shaped-charge warhead has blast-frag capabilities that increase lethality. Survivability will be improved in JAGM by an increased launch acceptability region and countermeasure resistance versus HELLFIRE.

The MMW guidance can be activated while still on the aircraft giving the operator a fire-and-forget capability. JAGM will replace all variants of HELLFIRE and will be capable of destroying armor, maritime craft, bunkers, and buildings, with an expected IOC on AH-1Z in FY20.

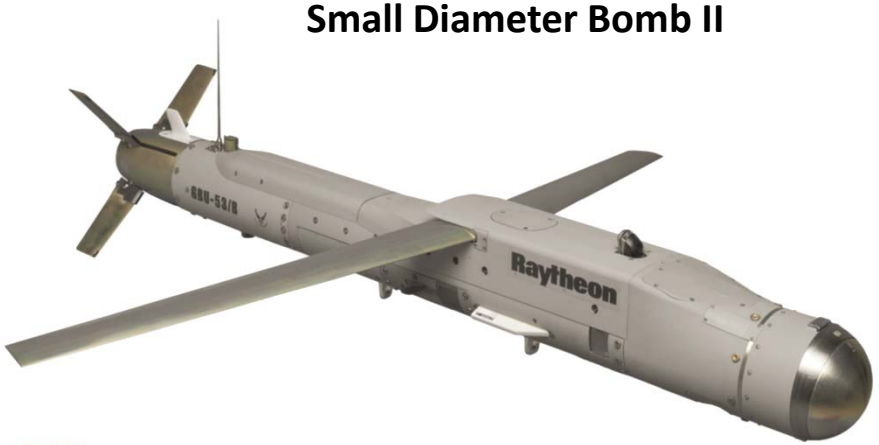
BOMBS

The **AGM-154 Joint Stand-Off Weapon (JSOW**) C-1 is a net-enabled weapon that provides a Moving Maritime Target (MMT) capability with stand-off. JSOW C-1 will IOC on F-35C in FY21.

The **GBU-53 Small Diameter Bomb II (SDB II)** is a 250-pound class, precision-guided, all-weather munition, eight of which the F-35B and C will carry internally. SDB II is a gliding, stand-off, direct-attack weapon suitable against fixed and moving targets in day, night, and adverse weather. It is network-enabled, utilizes a tri-mode seeker with SAL, MMW, and Imaging Infra-Red (IIR), and will IOC on the F-35B with Block 4.1 software in FY21.

Initiatives are in place at HQMC Aviation to **accelerate existing common TACAIR weapons into F-35B** prior to Block 4.1. In an effort to promote interoperability and support contingency operations with the United Kingdom, the British Paveway IV 500-pound dual mode bomb will be integrated into F-35B. Additionally, GBU-49 is planned for integration on F-35B in Block 3F for contingency operations.

Small Diameter Bomb II



GUNS

HQMC, in conjunction with NAVAIR, is **researching improved 20mm and 25mm ammunition** for air-to-ground delivery. Potential capabilities include improved point detonation, increased armor penetration, and incendiary effects.

Aviation Non-Combat Expenditure Allowances (NCEA) continue to be adjusted based upon readiness requirements. Increases have been made to Laser Maverick, GBU-24, SLAM-ER, AIM-9M, as well as Fixed Wing APKWS II. Additionally, Dual Mode LGB inventories will be available for training use upon release of the Weapon Danger Zone.

MARINE AVIATION WEAPONS AND MUNITIONS PLAN

2018 2020 2030

TACAIR

2.75” Rockets APKWS II M282

General Purpose Bombs / LJDAM Small Diameter Bomb II

HARM / AARGM AARGM-ER*

LMAV

Rotary Wing

GAU-17 / GAU-21

LAU-61/68 DRL*

2.75” Rockets / APKWS II M282 MPP

2.75” MRIP*

Hellfire JAGM

AIM-9M AIM-9X

Harvest HAWK

Hellfire JAGM

Griffin

Viper Strike

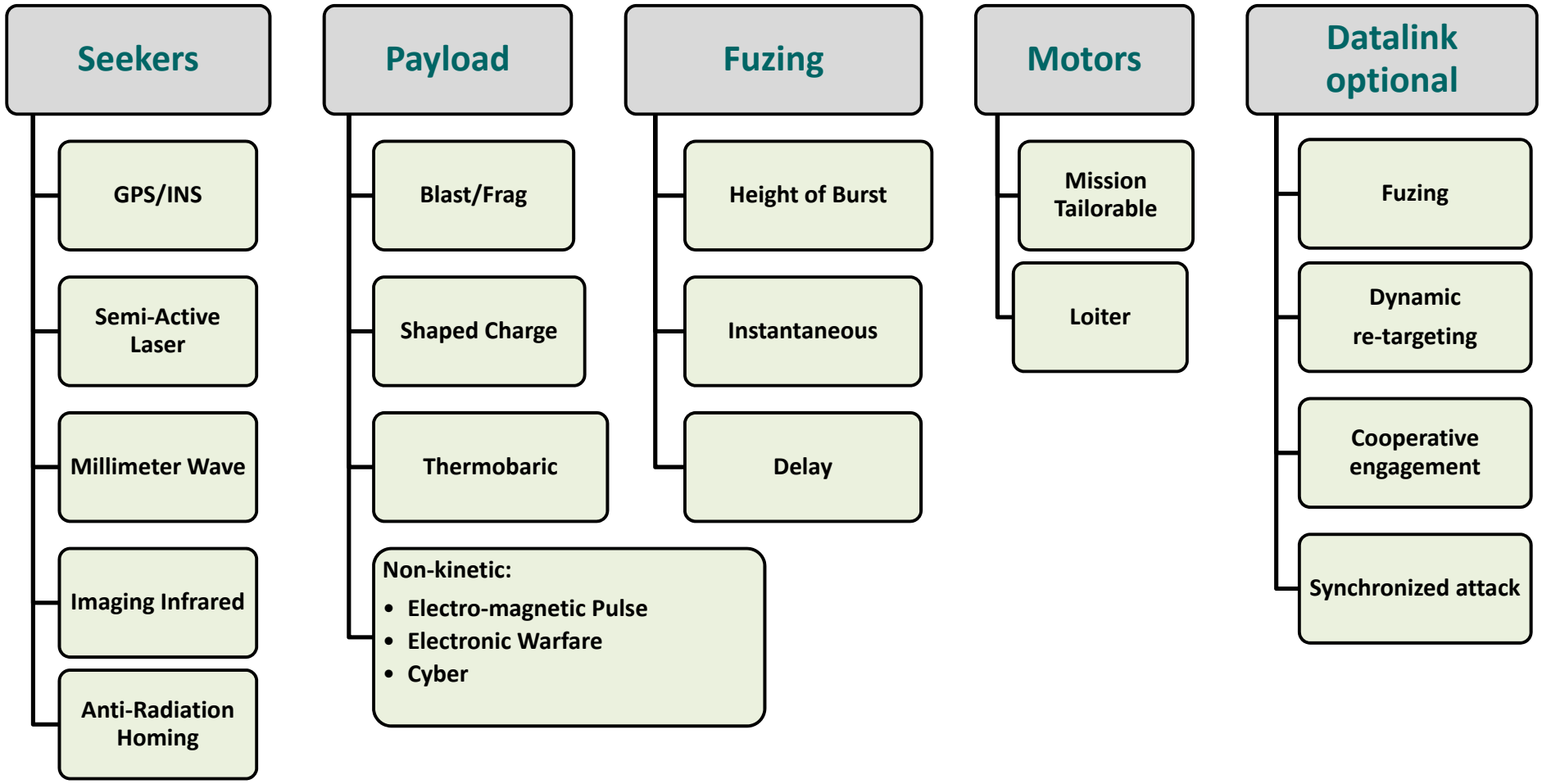
Tilt Rotor

Gun Enhanced Defensive Weapon/SOPGM*

UAS

Miniature Guided Munition*

MARINE AVIATION WEAPONS AND MUNITIONS PLAN



- Increased kills per sortie
- Economies of scale
- Maximize ship's fill space
- Low cost
- Counter measure resistant
- Open architecture / Reprogrammable
- Common launchers / racks / LAUs

Section 3 Marine Aviation Future: Vision, Initiatives and Technology

3.1 MAGTF Digital Interoperability

3.2 Military Construction and Ranges

3.3 Marine Aviation Synthetic Training

MAGTF DIGITAL INTEROPERABILITY

MAGTF DIGITAL INTEROPERABILITY (DI)

Digital interoperability is **the seamless integration of 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, each platform (and 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 to be digitally interoperable:

A *Sensor* that takes information from the environment and turns it into digital data; examples include 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.

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 tactical data links** that are fielded widely enough across the MAGTF that minor enhancements to platforms can greatly improve capability. **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 -- While our 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. Our 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 as the interface to the tactical network; is a secure collaborative briefing, planning, execution, and de-briefing tool.

Naval Simulation Services (NSS) – In an effort to more efficiently and 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.

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 immediately followed 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

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

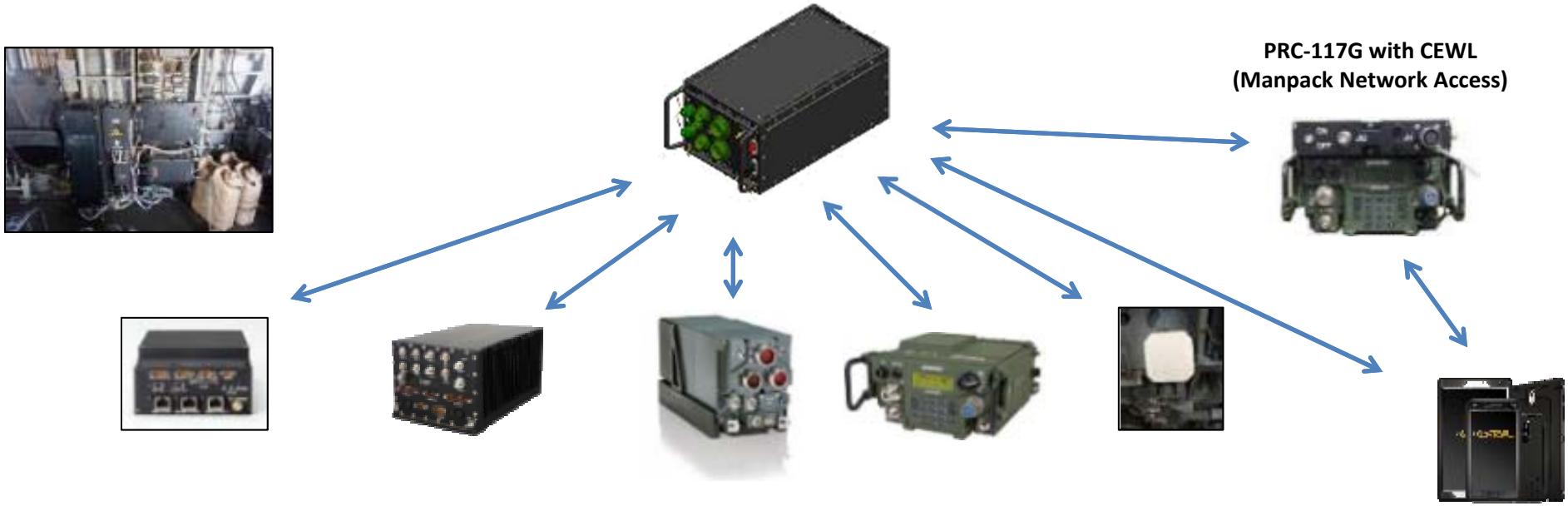
NEAR TERM DI EFFORTS

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 FY18, 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.

MESH NETWORK MANAGER

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



MAGTF DIGITAL INTEROPERABILTY

GATEWAYS

Airborne 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.

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 FY20.

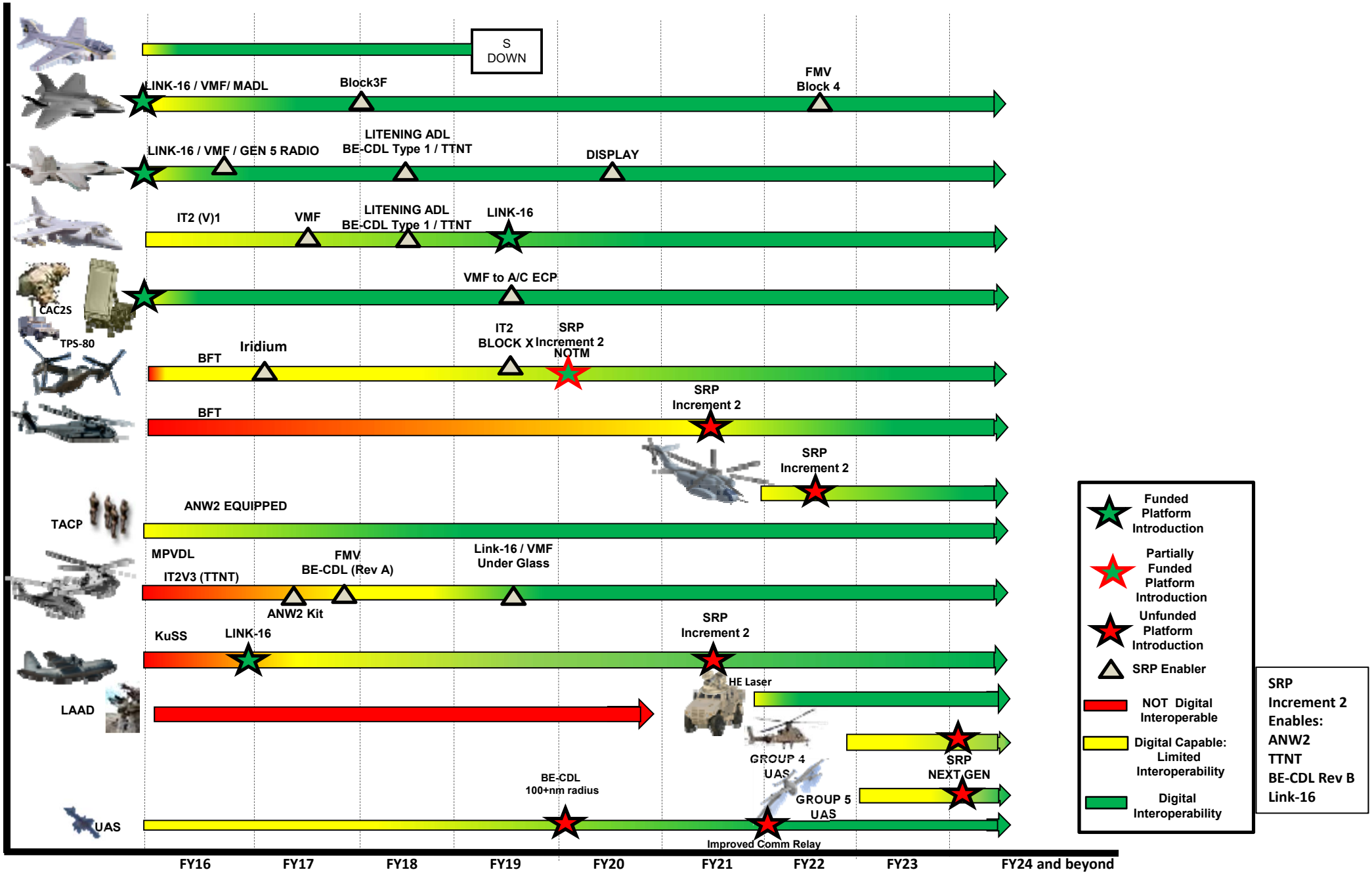
FUTURE DI EFFORTS

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 Probably 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. The adoption of future technology will position the Marine Corps to be the warfighting force with the greatest flexibility in digital communications and will be critical to defeating the threat. 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** available that can be used to flexibly meet IERs across all MAGTF mission threads.

MAGTF DIGITAL INTEROPERABILITY

EVERY PLATFORM A SENSOR, SHOOTER, ELECTRONIC WARFARE NODE AND SHARER



MARINE CORPS MILITARY CONSTRUCTION PLAN

Aviation **military construction (MILCON) projects are essential to achieving the Commandant's vision for Marine Corps aviation.** MILCON projects enable IOC fielding for introducing new weapon systems, such as the CH-53K, RQ-21A, and F-35 to the operational forces and training commands. MILCON designs will focus on flexibility of use to allow new weapon systems, squadron relocations, and re-designations to serve MAGTF requirements as they evolve over time. Marine Corps aviation's new weapon systems have a much greater range and more robust capabilities than legacy platforms. As a result, the use of air station facilities, ranges, and air space may differ to accommodate these enhanced capabilities.

The MILCON, DPRI, and host nation projects listed in the following tables represent projects required for the realization of the current AvPlan, air safety or required to address some deficiencies. The project tables represent a snapshot in time, are subject to change and include pure AvPlan and regular air station projects.

Marine Corps air stations and air facilities must remain viable in the future. Where possible, existing physical assets will be used as a bridge to the full funding and construction of MILCON programs. The introduction of F-35 and other weapon systems will require additional MILCON resources to mitigate programmatic and operational risk to both Marine Corps aviation and the Marine Corps as a whole. Marine aviation has planned MILCON projects which validate the commitment to establish a F-35 capability within the MEFs as per the TACAIR Transition Plan.

MARINE CORPS MILITARY CONSTRUCTION PLAN

MCI EAST								
QUANTICO AIR FACILITY			**CHERRY POINT, CONT.**			**BEAUFORT**		
FY16	P-647	ATFP GATE	FY24	P-173	MWCS DETACHMENT FACILITIY	FY17	P-464	AIRCRAFT HANGAR - VMFAT
CHERRY POINT			FY27	P-201	F-35 HANGAR (1 MODULE) RESERVE	FY20	P-486	REPLACE OSCAR BARRACKS
FY16	P-222	AIRFIELD SECURITY UPGRADES	**NEW RIVER**			FY20	P-457	CRYOGENICS FACILITY
FY18	P-990	VERTICAL LIFT FAN TEST FAC	FY19	P-707	BACHELOR ENLISTED QUARTERS	FY20	P-476	CONSOLIDATED COMM COMPLEX
FY19	P-235	RECONFIG FLIGHTLINE UTILITIES, PH I	FY19	P-680	CARGO LOADING TRAINER	FY20	P-485	F-35 OPERATIONAL SUPPORT FACILITY
FY19	P-199	F-35 HANGAR (2 MODULES)	FY20	P-378	CH-53K REPLACE AS3905	FY20	P-458	LAUREL BAY FIRE STATION
FY20	P-204	TRAINING AND SIMULATOR FACILITY	FY20	P-690	STATION ARMORY	FY21	P-477	JET FUEL SYSTEM CAPACITY EXPANSION
FY20	P-228	ATC TOWER & AIRFIELD OPS FAC	FY20	P-728	C-12 A/C MAINT HANGAR	FY21	P-487	CLIMATE CONTROLLED WAREHOUSE
FY20	P-206	RUNWAY IMPROVEMENTS	FY20	P-712	DOUGLASS GATE SECURITY UPGRADE	FY22	P-475	AIRCRAFT HANGAR - VMFAT
FY20	P-658	INDOOR FITNESS FACILITY	FY20	P-389	GROUP HEAD QUARTERS MAG-29	FY22	P-488	WAREHOUSE
FY20	P-134	PHYSICAL SECURITY - SLOCUM ROAD	FY20	P-709	ORDNANCE STORAGE	FY22	P-471	MAG-31 HEADQUARTERS
FY21	P-210	MCALF BOGUE AIRFIELD IMPROVEMENTS	FY20	P-706	SQUADRON WAREHOUSE	FY22	P-481	MRAP STORAGE AND MAINTENANCE FAC
FY21	P-197	F-35 HANGAR (2 MODULES)	FY20	P-724	LIBRARY AND EDUCATION CENTER	FY22	P-480	UPGRADE COMM INFRASTRUCTURE
FY21	P-239	FLIGHTLINE UTILITIES UPGRADE, PH II	FY20	P-713	THEATER	FY23	P-483	RUNWAY OVERRUNS
FY21	P-242	WING INTEL SUPPORT COMPANY FAC	FY21	P-386	REPLACE AS4108	FY23	P-478	STATION MAINTENANCE COMPLEX
FY22	P-205	VERTICAL LANDING PAD IMPROVEMENTS	FY22	P-660	REPLACE AS515	FY23	P-489	WAREHOUSE
FY22	P-207	GROUND SUPPORT EQUIPMENT SHOP	FY23	P-666	REPLACE AS518	FY24	P-490	ORDNANCE CONTROL BUNKERS
FY22	P-209	ENGINE MAINTENANCE FACILITY	FY24	P-672	REPLACE AS4106	FY24	P-479	EXPEDITIONARY CONSTRUCT COMPLEX
FY22	P-226	MALS 14 MAINT HANGAR / MAG14 HQs	FY28	P-721	MALS ADDITION	FY24	P-462	F-35B ASSAULT STRIP
FY22	P-080	ATLANTIC FIELD SECURITY	**CAMP LEJEUNE**					
FY23	P-200	F-35 HANGAR (2 MODULES)	FY20	P-456	REPAIR RWY 5/23 CAMP DAVIS SOUTH			
FY23	P-129	MACS-2 OPERATIONS & MAINTENANCE						
FY23	P-143	PHYSICAL SECURITY - MAINGATE						
FY23	P-227	CONSTRUCT TARGET BERMS AT BT-11						
FY24	P-162	SECURITY OFFICE						
FY24	P-562	POST OFFICE						
FY24	P-142	FIRE STATIONS						

Notes

- Dates reflect project program year, typically the year of construction start. Fiscal programming normally occurs at least two years prior.
- Construction and facility activation schedules vary based on project type.
- Prior year funded projects not shown for clarity.

MARINE CORPS MILITARY CONSTRUCTION PLAN

MCI WEST								
YUMA			YUMA, CONT.			MIRAMAR, CONT.		
FY18	P-539	ENLISTED DINING FACILITY	FY24	P-542	MWSS-371 RELOCATION	FY20	P-263	EAST GATE ENTRY CONTROL POINT
FY20	P-538	BACHELOR ENLISTED QUARTERS	FY25	P-419	LIFELONG LEARNING CENTER	FY20	P-264	EAST & WEST GATE ENTRY CONTROL
FY20	P-596	HANGAR 95 RENOV & ADD (VMX F-35)	FY25	P-450	RELIGIOUS EDUCATION CENTER ADD	FY20	P-262	NORTH GATE ENTRY CONTROL POINT
FY20	P-591	WATER TREATMENT FACILITY	FY25	P-640	AIRFIELD DUST ABATEMENT	FY20	P-250	CHILD DEVELOPMENT CENTER
FY20	P-504	CONSOLIDATED STATION ARMORY	FY25	P-532	SECURE ACCESS CONTROL FACILITY	FY20	P-166	LEGAL SERVICES CENTER
FY20	P-364	FITNESS/WATER SURVIVAL TRAIN FAC	FY26	P-598	CONSOLIDATED CHILLER FACILITY	FY20	P-256	MALS HANGAR COMPLEX
FY20	P-501	FIRE STATION	FY27	P-616	LOX/N2 FACILITY	FY21	P-193	BACHELOR ENLISTED QUARTERS
FY21	P-623	MOUT COLLECTIVE TRAINING FACILITY	FY27	P-553	POST OFFICE	FY22	P-201	F-35 AIRCRAFT MAINT HANGAR B
FY21	P-606	VMU-1 HANGAR & LOG COMPLEX	FY27	P-580	FLIGHT LINE PARKING STRUCTURE	FY22	P-254	F-35 CENTRALIZED ENGINE REPAIR FAC
FY21	P-622	BEQ (F-35)	MCAS PENDLETON & MCB PENDLETON (AIR SUPPORT)			FY22	P-266	CH53K SIMULATOR FACILITY
FY22	P-620	MAINT ADDITION TO H78	FY19	P-134	MULTI-PLATFORM AVIATION SIM FAC	FY23	P-204	VEHICULAR BRIDGE
FY22	P-621	MAINT ADDITION TO H80	FY20	P-120	MAINT HANGAR EXPANSION	FY23	P-205	PLESS AVE ROAD EXTENSION
FY22	P-576	ALF PH II (F-35)	FY20	P-137	AVN CORROSION CONTROL FAC	FY23	P-258	HANGAR 3 MOD AND ADDITION
FY22	P-531	TAC AIR COMMAND CENTER	FY20	PEN121	SIMULATED LHA DECK TO CONCRETE	FY23	P-190	TACTICAL COMM OPS & TRAIN FAC
FY22	P-493	RUNWAY 3R/21L EXTENSION	FY20	PEN1056	LHD PAD MODERNIZATION	FY23	P-191	TACTICAL AIR CONTROL EQUIP FAC
FY22	P-446	CONSOLIDATED ORDNANCE DISPOSAL	FY20	PEN1057	VTOL PAD MODERNIZATION	FY23	P-194	ARMORY ADDITION
FY23	P-585	RUNWAY UPGRADES (F-35)	FY20	PEN1058	HOLF RUNWAY LIGHTING IMPROVEMENTS	FY23	P-244	MATCU OPERATIONS BUILDING
FY23	P-579	AVIATION MAINTENANCE STORAGE FAC	FY21	P-140	ARM AND DEARM TAXIWAY	FY24	P-197	INDOOR FITNESS FACILITY
FY23	P-568	CLC-16 COMPOUND	FY21	P-135	AVIATION PRESERVATION WAREHOUSE	FY24	P-216	RUNWAY 24R PHASE 1
FY23	P-551	AIRCRAFT MAINT HANGAR (F-35)	FY21	P-139	AIRCRAFT RESCUE FIRE FIGHTING STATION	FY25	P-234	RUNWAY 24R PHASE 2
FY23	P-536	MAG/MALS/STATION OPS FACILITY (F-35)	FY22	P-138	MARINE AVIATION VMU-4 FACILITIES	FY27	P-202	F-35 AIRCRAFT MAINT HANGAR C
FY23	P-503	TRANSIENT QUARTERS	FY22	P-141	AIRCRAFT MAINTENANCE HANGAR 4&5	TBD	TBD	WING INTEL SUPPORT COMPANY FAC
FY24	P-600	MAINT BUILT IN TEST PADS (F-35)	MIRAMAR			MFR MILCON -- VARIOUS LOCATIONS		
FY24	P-589	VL PAD	FY18	P-242	DEHUMID SYSTEM AVN ARM UMC	FY18	P-077	MFR SIMULATOR FACILITY -- NAS FW
FY24	P-572	COMPOSITE REPAIR FACILITY (F-35)	FY19	P-210	F-35 SIMULATOR FACILITY	FY18	P-650	APRON, TAXIWAY & SUPPORT -- JBDIX
FY24	P-570	AIRCRAFT MAINT HANGAR (F-35)	FY19	P-238	F-35 AIRFIELD SECURITY			
FY24	P-421	STUDENT QUARTERS BOQ	FY19	P-222	F-35 VERTICAL LANDING PADS			
FY24	P-587	TAXIWAY UPGRADES	FY20	P-225	AIRFIELD TAXIWAY			

Notes

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MARINE CORPS MILITARY CONSTRUCTION PLAN

MCI PAC								
KANEOHE BAY			**OKINAWA MARINE WING LIAISON KADENA**			**OKINAWA CONSOLIDATION PROGRAM (DPRI)**		
FY18	P-887	LHD PAD CONV & MV22 LZ IMPROVE	FY20	P-810	MWLK BARRACKS	TBD	TBD	1st MARINE AIR WING HQ FACILITY
FY18	P-949	FUEL PIT AND TAXIWAY IMPROVE	**IWAKUNI (DPRI)**			TBD	TBD	MTACS-18 AIR SURV RADAR FAC
FY19	P-946	MALS CORROSION CONTROL HANGAR	2018	MC255T	FLIGHT LINE INFRASTRUCTURE	TBD	TBD	MACG-18 AND MWCS-18 HQ FACILITY
FY20	P-948	MALS-24 MAINTENANCE FACILITY	2018	MC164T	STATION/VISTING AC APRON & SUPPORT	TBD	TBD	MWCS-18 WAREHOUSE
FY20	P-951	MAIN GATE ENTRY CONTROL AT/FP	2018	MC908T	HAZADOUS CARGO LOADING AREA	TBD	TBD	MWCS-18 AUTO SHOP
FY20	P-877	MOKAPU GATE ENTRY CONTROL AT/FP	**GUAM - ANDERSON AB (DPRI)**			TBD	TBD	BEQ (E6-E9) COURTNEY
FY20	P-931	PUULOA RANGE COMM/ELEC & GATE	2019	P-601	AIRCRAFT HANGAR #2	TBD	TBD	BEQ (E1-E5) COURTNEY
FY20	P-913	MAG-24 ARMORY EXPANSION	2019	P-250	MALS FACILITIES	TBD	TBD	BOQ COURTNEY
FY20	P-930	FIRE STATION	2019	P-260	CORR CONTROL HANGAR	TBD	TBD	ENLISTED DINING HALL CAMP COURTNEY
FY20	P-879	ORDNANACE STORAGE MAGAZINE	2019	P-270	ACE GYM & DINING	TBD	TBD	MACS-4 HEADQUARTERS FACILITY
FY20	P-911	BACHELOR ENLISTED QUARTERS PH II	2019	P-295	ORDNANCE OPS	TBD	TBD	MACS-4 ELECTRONICS MAINT FACILITY
FY21	P-875	WATER RECLAMATION FAC	2019	P-280	AIR OPS BLDG	TBD	TBD	MACS-4 WAREHOUSE
FY21	P-891	HANGAR 102 MODERNIZATION	2022	P-290	EARTH MAG	TBD	TBD	BEQ (E1-E5) HANSEN
FY21	P-774	PTA EQUIPMENT STORAGE	**OKINAWA FUTENMA REPLACEMENT FACILITY (DPRI)**			TBD	TBD	BEQ (E6-E9) HANSEN
FY21	P-926	MALS ORDNANCE STORAGE	FY21	MC1566-T	MAINTENANCE HANGAR (HMH)	TBD	TBD	BOQ HANSEN
FY21	P-916	MV-22/HMLA WAREHOUSE	FY21	MC1563-T	MAINTENANCE HANGAR (VMM1)	**IWAKUNI**		
FY22	P-882	RUNWAY CLEAR ZONE BLDG DEMO/IMPRV	FY24	MC1530-T	RUNWAY	2018	MC407	CSSD-36 MAINTENANCE COMPOUND (JFIP)
FY22	P-928	PTA AMMUNITION STORAGE	FY24	MC1531-T	TAXIWAY	FY18	P-992	BULK FUEL STRG TANKS-PACOM (DESC)
FY22	P-876	AIRFIELD SECURITY FENCING & UPGRADE	FY24	MC1551-T	AIRFIELD PARKING APRON	FY19	P-993	PROVIDE T-5 CAPABLE PIER (DESC)
FY22	P-836	MAG-24 HQ AND PARKING BUILDING	FY25	MC1562-T	CORROSION CONTROL HANGAR	FY18	P-1006	KC130J ENLISTED AIR CREW TRAIN FAC
FY22	P-912	BACHELOR ENLISTED QUARTERS PH III	FY25	MC1564-T	MAINTENANCE HANGAR (VMM2)	FY20	P-1005	VTOL PAD – SOUTH
FY25	P-883	RUNWAY UNDERPASS	FY25	MC1565-T	MAINTENANCE HANGAR (HMLA)	FY20	P-1000	ACFT MAINT HANGAR IMPROVE, SOUTH
FY25	P-915	MCCS SELF STORAGE	FY25	MC1567-T	MAINTENANCE HANGAR (FRC WP/MALS)	FY21	P-1001	ACFT MAINT HANGAR IMPROVEMENTS
OKINAWA MCAS FUTENMA			FY25	MC1568-T	MAINTENANCE HANGAR (OSA)			
FY20	P-202	GATE 1 UPGRADE						
FY20	P-205	AIRCRAFT RUNWAY OVERRUN						
FY20	P-214	JP-5 FUEL TRUCK OFF-LOAD SYSTEM (DLA)						

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MARINE CORPS RANGES

The Mission Capable Ranges Program (MCRP) is designed to meet the guidance of the *Marine Corps Service Campaign Plan* (MCSCP). Marine Corps range program planners continue to look for ways to better support and develop training scenarios consistent with Marine Corps Vision and Strategy 2025, Expeditionary Force 21, and the Regional Range Complex Management Plans (Regional RCMP). These plans look to accommodate current and future training scenarios that meet the expanded operating forces' military mission footprint for readiness.

Since no military range complex encompasses the extent of land area, sea-space and airspace necessary to replicate the extended complex modern battlefield, the **Marine Corps also makes extensive use other service range areas as well as training on non-DoD lands (e.g. BLM, USFS, and USFW) to conduct regional training exercises.** The MCRP provides the Marine Corps with a comprehensive, fully developed range program that defines current, emerging, and future range requirements.

The MCRP executes range modernization and sustainment initiatives focused on the diverse training needs of Marine Air Ground Task Forces (MAGTF).

The cornerstones of the program are:

SUSTAIN RANGE AND TRAINING SYSTEM CAPABILITIES

The Marine Corps has made historic investments in range and training area infrastructure in the past decade and sustaining the capabilities these investments provide is a foundational pillar of the Mission Capable Ranges program.

MAXIMIZE TRAINING CAPACITY

The Marine Corps' greatest challenge in supporting live training is the provision of sufficient land and air space to accommodate the requirements of modern weapons, tactics, and force structure. Effectively managing and operating Marine Corps ranges is the key to maximizing capacity and training quality of our limited range resources.

MODERNIZE RANGES

Range modernization focuses on providing capabilities to address currently identified gaps in range capability that have a negative impact on training and providing capabilities to address emerging requirements resulting from the introduction of new systems or mission requirements.

PRESERVE THE NATURAL ENVIRONMENT AND MITIGATE ENCROACHMENT

Marine Corps installations, located in littoral areas and sensitive desert environments, are among the most heavily encroached-upon in the DoD. The Marine Corps' real estate portfolio is already challenged to support the training requirements of modern weapons, tactics, and organizations; **encroachment issues pose a significant challenge** to our training areas. Encroachment management seeks to prevent, repair, and mitigate these mission constraints to enhance the overall mission readiness of the Marine Corps while still meeting the requirements to preserve and sustain the natural environment.

MARINE CORPS RANGES

RANGE COMPLEX MANAGEMENT PLANS (RCMP)

RCMPs serve to identify and document RTA capability, capacity, and shortfalls, and are intended to provide timely and relevant input to the RTA Management Program and MCICOM to support planning and programming for RTA modernization, recapitalization, sustainment, and management. Each installation will prepare and maintain a RCMP. The RCMP is intended to serve as a master planning document for RTAs, providing a consistent Marine Corps-wide framework for defining RTA modernization and management objectives, and integrating into RTA planning efforts. RCMPs will be updated every 5 years or as required.

CG MCCDC (C465) will fund Regional RCMPs addressing RTA capabilities, shortfalls, and management matters focused on requirements supported by or issues affecting multiple Installations. Regional RCMPs will address requirements for access for training to other services, departments and private land areas, sea space, and airspace that are not within a Marine Corps installation.

The aviation community can advocate for aviation range modernization, recapitalization, and sustainment through the installation and regional RCMPs.

Marine Corps ranges have lacked the capability to fully exercise a large MAGTF in a realistic, doctrinally appropriate training scenario. Specifically, the Marine Corps Air Ground Combat Center (MCAGCC) at Twenty-nine Palms, as the center of excellence for developing and executing combined arms live-fire training of the MAGTF, has not been able to accommodate a full-scale, live-fire Marine Expeditionary Brigade (MEB) exercise. The **expansion of MCAGCC**, made possible with significant congressional support, will correct this training and readiness deficiency and significantly enhance the Marine Corps' ability to continue providing fully-capable MAGTFs in pursuit of national security objectives. The expanded lands have had limited use to date as issues with the airspace above the expanded lands is still being negotiated with the FAA. A major large-scale exercise was executed in the summer of 2017.

Inadequate live-fire and maneuver training opportunities limit Marine units stationed in the Western Pacific and Hawaii. Marine Corps ranges in Hawaii and Okinawa lack sufficient capabilities to fully support training for their assigned units. Consequently, these units must satisfy their training requirements on other military service facilities, particularly U.S. Army ranges in Hawaii or U.S. Air Force and Japanese ranges in Okinawa and Japan. It is a constant challenge to deconflict the various missions to ensure Marines receive adequate training opportunities.

Furthermore, training areas on Oahu and throughout Hawaii are subject to significant encroachment pressures from renewable energy development on- and offshore, resulting in increasing conflicts over the use of land, air, and seaspace. This problem will be further exacerbated in coming years as some Okinawa-based forces relocate to Hawaii as part of the Defense Policy Review Initiative (DPRI) and there is an increase in operational flying squadrons at MCB Hawaii tied to the *Marine Aviation Plan*. DPRI also includes relocating deploying units from Okinawa to Guam and developing associated basic training ranges and infrastructure. On Guam, individual Marine skills ranges are part of the Guam Supplemental Environmental Impact Statement (EIS).

MARINE CORPS RANGES

U.S. Pacific Command (PACOM), with the Marine Corps as executive agent, has sponsored the Combined Joint Military Training (CJMT) EIS to address existing and future training deficiencies in the Western Pacific, specifically the Mariana Islands. The CJMT EIS effort is studying the possibility of 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**. Finally, training opportunities in Australia are also being utilized to address rotational force training requirements.

The Marine Corps has identified the need for an aviation training range on the East Coast of the United States capable of supporting precision guided munition training. **Expansion of Townsend Bombing Range i**s the best alternative for securing this East Coast capability.

A Record of Decision (ROD) to expand Townsend was signed in January 2014. Acquisition efforts are underway and a formal airspace proposal supporting the land expansion has been submitted to the FAA. Due to refined projections for completion of real estate and funding actions, full operational capability is **planned for December 2019**.

With congressional support, the **Marine Corps has invested over $800 million in range capabilities** over the past decade. Programming to support new range-related investments, however, may be threatened in an uncertain funding climate. Funding priority will remain focused on the sustainment and recapitalization of existing capabilities and the currently projected level of FY2018 funding will meet the basic requirements of sustaining current capabilities. As previously noted, future fiscal reductions may adversely affect the Marine Corps' ability to maintain range resources. Without sufficient commitments focused at a minimum on maintenance and re-capitalization, today's range capabilities will become tomorrow's liabilities, with adverse impacts on the ability of Marine Corps installations to support required training with mission-capable ranges.

MARINE CORPS RANGES

LIVE AVIATION TRAINING SYSTEMS (LATS) PROGRAM OVERVIEW

With the introduction of new aircraft capabilities in recent years, such as with the MV-22B and UH-1Y, the ongoing fielding of the F-35B/C and AH-1Z, and the near-future fielding of the CH-53K and new UASs, it is time for Marine aviation to establish a program that takes a vested interest in its "live" training infrastructure to ensure we are able to support our new aircraft with their new capabilities, including new and planned weapons systems and munitions.

With these new aviation capabilities, Marine aviation must now review the requirements for and capabilities of our "live aviation training systems (LATS)" which include **aviation ranges, targets** (includes threat systems and emitters), **auxiliary and outlying landing fields** (ALF/OLF), **airspace, cyberspace/electro-magnetic spectrum** (EMS), and any other live aviation training DOTMLPF-P issues. With the identification of deficiencies or gaps in our live training capabilities, i.e. the live training infrastructure, we will work with supporting establishments to improve these capabilities.

Some of our MAWs have already started regional efforts to improve their local LATS by working with the regional Marine Corps Installations (MCI), Marine Corps Air Stations (MCAS), and aviation ranges. For example, 2d MAW recently conducted what they termed the Ranges 2030 Project, which looked out to the year 2030 and forecasted the LATS required at that time for their aircraft, aviation C2, and AGS. Since their study, 2d MAW has established planning teams to identify some of the training infrastructure gaps. Actions to date include developing a local capability for KC-130J Assault Landing Zone (ALZ) training, studying/proposing possible locations for tiltrotor and rotary-wing restricted visibility landing (RVL) sites, and establishing additional training capabilities on air-to-ground ranges for precision guided munitions (PGM) employment.

MARINE AVIATION SYNTHETIC TRAINING

AVIATION TRAINING SYSTEM (ATS) PLAN

A combination of challenging operational environments, decreasing training resources and budgets, and a lower deployment- to- dwell ratio requires Marine aviation to focus its training more effectively and efficiently to achieve and sustain the highest levels of combat readiness. 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 MAGTF commander with core and mission skill proficient combat ready units. Integrated ATS processes, governed by policy and supported by appropriate resources, provide the catalyst for incremental training system improvements. ATS integrates and coordinates policy, manpower, equipment, and fiscal requirements of post initial accession training for Marine aviation officers and enlisted personnel as well as initial accession aircrew training (Core Skill Introduction) for aviation units that conduct T/M/S specific aviation training (e.g. Fleet Replacement Squadron (FRS) or Fleet Replacement Detachments (FRD)). ATS processes and procedures shall be applicable to all current and future Marine aviation training programs to include naval or joint-level programs in which the USMC participates.

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.

ATS is intended to:

1) Provide operational commanders with a current, responsive and relevant training system for aircrew, aircraft maintenance, aviation ground support and C2 personnel.
2) Develop a holistic training system across every Marine aviation community throughout the training continuum that supports aircrew (pilot/NFO/enlisted), operators and maintainers.
3) Help proliferate standardization within the Marine aviation communities.
4) Develop concurrency management processes to ensure the training system (curriculum, courseware and training devices) remains relevant.
5) Address training and safety issues through SAT derived curricula and improved use of Risk Management (RM) and Crew Resource Management (CRM) principles.
6) Utilize Marine Aviation Training System Sites (MATSS) to facilitate the ATS program.

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.

MARINE AVIATION SYNTHETIC TRAINING

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.

MATSS contribute the following to the ATS process:

1) simulator and academic resource usage optimization;
2) flight leadership standardization and evaluation (FLSE) support; and
3) aircraft platform and community training management team (TMT) issue advocacy.

The MATSS construct has migrated across Marine aviation in the active and reserve components at thirteen sites. ATS products are continually analyzed for ways to improve Marine aviation unit readiness and technically refreshed appropriately to meet the demand for changes in the aviation training continuum with advancing technology. 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.

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 & 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 (CSTA)
4) Tactical Environment (TEn), 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

The MCASMP is intended to reduce overall procurement and sustainment training costs by procuring training devices and training media (courseware and curricula) with common hardware and software systems. The idea is to avoid the cost of developing new or platform unique type-systems; to pursue only the most promising developmental and mature technologies for training; and mitigate operational risks.

The Marine aviation simulator strategy outlines an **increased reliance on simulation to augment flight training and provide improved readiness.** The foundation for simulator key performance parameters will be based on the ability of the training device to provide and support a multi-ship capability for similar and dissimilar platforms, the integration of aircrew training, and the ability for aviation systems to be networked with other aviation, ground, and future C2 systems to support MAGTF level integrated training. At the micro-level, the ability of CONUS and OCONUS systems to satisfy capacity, capability, and networking requirements will be essential for achieving the end state of enhanced pilot and aircrew simulator training.

Fully integrated implementation of the MCASMP will foster a tipping point for Marine aviation, whereby the aviation community accepts the full capacity and capability of networked, high fidelity training systems as the “norm”. Its use is DEMANDED as part of complex, persistent, and scalable pre-deployment mission rehearsal training

CONCEPT OF THE COMMON DATABASE

The concept of the Marine Corps Common Visual Database (MCCVDb) originated from the Marine Corps Aviation Simulator Master Plan (MCASMP) policy, which required all newly acquired Marine Corps Aviation Training System simulators to function together as a system of tactically relevant networked trainers, when linked. The first common database was initially developed for and installed in a series of five Weapon Systems Trainers (WSTs) delivered to the USMC under the MCASMP procurement in the mid-90's.

The term common database identified the collective East Coast and West Coast United States visual databases installed in those same five WSTs. Under the MCASMP program, these five trainers were produced by the same contractor and, consequently, included a common visual system solution which included a common image generator (IG), display system, and run-time visual databases. The databases installed in each WST were exact copies of each other and were rendered and displayed by image generators and projectors of the exact same make and model. As a result, the training scenes presented to the trainees across these five training systems were correlated to each other. That was the origin of the common visual database concept.

Visual database fidelity and content correlation remain key issues to optimize to ensure optimal scene accuracy and interoperability across networked simulators. The introduction of non-aviation training systems into distributed missions operations and networked training increases the complexity to ensuring aviation simulators can be successfully network with simulators designed to train ground forces thereby creating a seamless, virtual, tactically relevant MAGTF training environment and form a robust LVC training construct capable of supporting high value integrated virtual MAGTF training.

Moving forward:

1) Improvements to the current common visual databases, culminating in one common synthetic training area, consisting of new geographic regions, and updated source files, in order to support MAGTF virtual training.
2) This Common Synthetic Training Area will evolve in terms of geographic regions available and improved fidelity and content - specifically with regard to imagery resolution and available database features.

The **goal is to further develop a single source, common visual database**, a USMC Common Synthetic Training Area (CSTA), that will be woven together from existing and future identified source code which is run time corrected for ATS Networked Devices and of sufficient fidelity to enable "fair fight" correlated simulated training environments. This environment will not only be used in the USMC ATS but across the MAGTF and joint services solutions to promote interoperability within ATS, the USMC GCE, and Joint Distributed Mission Training (DMT) Circuits.

Efforts by HQMC Aviation Weapon Systems Requirements Branch (APW), MARCORSYSCOM, NAVAIRSYSCOM, and TECOM will continue to develop an acceptable CSTA solution with the GCE, as well as with the joint and multi-national partners. Distributed Mission Training (DMT) environments incorporating common arenas will yield a limitless enhanced combat readiness training experience. Initial developmental focus will be in the southwestern United States with synthetic augmented operational environments embedded to represent non-native other terrain and environments with maximum fidelity.