

2022 UNITED STATES MARINE CORPS AVIATION PLAN







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SECTION 1



FROM THE DEPUTY COMMANDANT FOR AVIATION

The Department of Aviation is focused on the future and taking aggressive action to evolve Marine Corps aviation as part of the future force. We view the Commandant's Planning Guidance, flowing through Force Design, as "The Why" we are prioritizing aviation's evolution.

Force Design 2030 provides a roadmap for transitioning the Marine Corps into a more agile expeditionary force. It is in Force Design's guidance that the Marine Corps – and Marine Corps aviation – began the change to posture and force structure. The Commandant set us on the path to several revolutionary changes: making us lighter and more agile; executing long-range fires not just in aviation but through the innovation of the Marine Littoral Regiment; pushing command to the lowest level; and redesigning the rifle battalion. Likewise, revolutionary change is not new to Marine Corps aviation; we have led in the past with Close Air Support, Vertical Envelopment, and the development of tiltrotor aviation. We embrace this quality as we look to the future.

In executing the Commandant's guidance, we always have in mind his vision and his endstate. We as an expeditionary force must be agile, mobile, and survivable. This vision is built around distributed operations, littoral operations in a contested environment, and expeditionary advanced base operations to enable the stand-in force.

These doctrinal foundations describe the capabilities required of the future force; we will adapt Marine Corps aviation to these concepts and build an expeditionary aviation force that is lethal, effective, and survivable, and that continues to create a warfighting advantage.

The Aviation Hallway has reorganized and reoriented to lead change across Marine aviation. We have transitioned from linear branches into functional, capabilities-based divisions; changed our mindset from a focus on platforms to focusing on capabilities; and reoriented ourselves from being a hierarchical staff to being a dynamic system. The Hallway is translating vision into capabilities, and in turn into programmatic. Those programmatic are reflected in this document.

The Marine Aviation Plan flows from the Aviation Campaign Plan. We are adapting our aviation vision and our mission in accordance with the principles in Force Design 2030, which has helped us update both to better reflect our tight integration into the processes across Headquarters Marine Corps and the naval force. We designed a plan for executing the aviation vision and achieving the Commandant's endstate. You will see those things – the "How" we will get to the future - in these pages.

Semper Fidelis,



Mark R. Wise
Lieutenant General, U.S. Marine Corps
Deputy Commandant for Aviation

DEPUTY COMMANDANT FOR AVIATION'S VISION FOR MARINE CORPS AVIATION, 2030 AND BEYOND

Marine Corps aviation delivers lethal, effective, and survivable capabilities to enable naval and joint campaigning in all domains across the continuum of conflict. While operating from austere, distributed locations and across extended distances, we will be minimally sustained, fully networked, and entirely interoperable with the Joint Force and America's allies and partners.

Marine Corps aviation provides a cutting-edge advantage to the naval expeditionary force through the six functions of Marine Corps aviation and the four types of maritime aviation operations. The stand-in ACE is integral to tomorrow's MAGTF, bringing lethal, agile, and sustainable capabilities to compete with, deter, and – if necessary – defeat our nation's adversaries.

DEPARTMENT OF AVIATION SPECIFIED TASKS

A. Integrate, coordinate and develop fully informed assessments of Marine Corps aviation readiness, capability, and capacity, to inform HQMC and DON strategic and operational planning, risk assessment, requirements development, concept development, resourcing alignment, force management, and force generation.

B. In coordination with DC P&R, DC CD & I, other HQMC departments, the OPNAV staff, and the DON Financial Management Branch, assist aviation commanders in the Fleet Marine Force to achieve and sustain the material readiness, reliability, and relevance required to meet operational requirements by developing aviation-related plans, policies, and readiness practices.

C. Assist in the production of highly trained and educated aviation personnel capable of performing all assigned Mission Essential Tasks by identifying aviation training requirements and policy with Naval Air SYSCOM, Marine Corps SYSCOM, Program Executive Offices, Commander Naval Air Forces, Commander Naval Education and Training, Commander Naval Aviation Training, the CNO, Naval Aviation Warfare Development Command, Training and Education Command, and MAWTS-1.

D. Conduct long-range planning, in excess of a 20-year horizon, to inform service-level development of innovative aviation-related technologies and systems that enhance the MAGTF's lethality and reduce the risk of the future operating environment.

E. Advise the Commandant and inform the joint force on the application of Marine Corps aviation as part of the NEF while informing and supporting the development of service, joint, and allied aviation warfare concepts and doctrine.

F. Conduct activities directed by United States law, or Department of Defense, Department of the Navy, and Marine Corps orders, instructions, and directives to support the overall function of HQMC. Adjudicate Flight Status Suitability Boards and direct the Air Support Control Office.

G. Represent the United States Marine Corps on aviation matters, as directed by the Commandant, and in coordination with the Communication's Directorate and the Office of Legislative Affairs to advocate for service priorities and communicate Service themes and messages.

H. Ensure unity of effort with HQMC by maintaining regular engagement, information exchange, and liaison with adjacent departments, integrating stakeholder participation in Service-level processes, and synchronizing parallel efforts.

I. For the Commandant, exercise administrative control of HMX-1. Provide operational tasking for the employment of non-executive aircraft; the White House Military Office will provide operational direction for the employment of executive helicopters.

J. For the Commandant, exercise operational control of VMX-1 for flight operations not in direct support of test plans approved by COMOPTEVFOR or MCOTEA.

K. Through TECOM, coordinate with MAWTS-1 to inform aviation warfighting concepts and innovation

DEVELOPING THE VISION

THE CUNNINGHAM GROUP

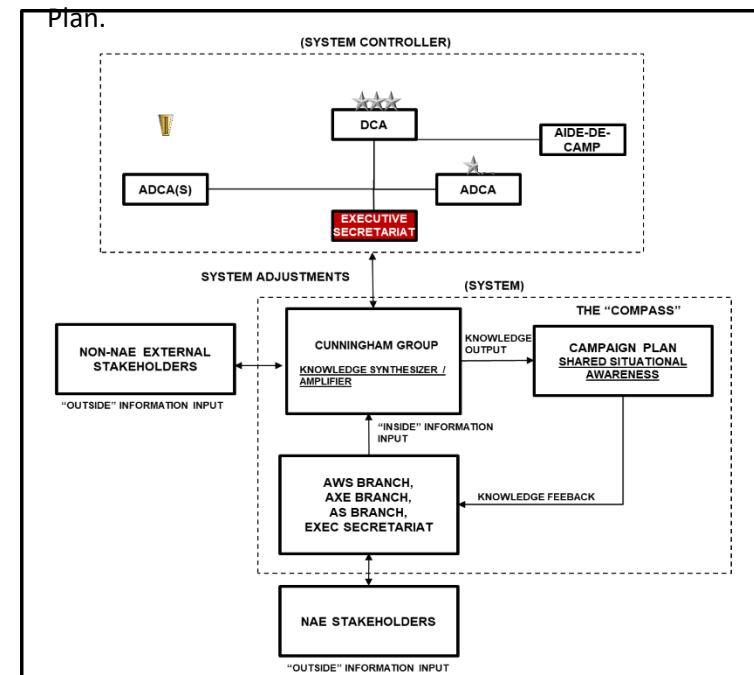
The Deputy Commandant for Aviation challenged the Cunningham Group to develop a capability-focused, threat-informed vision for how Marine Aviation operates as a foundational element of the Stand-In Force in 2030 and beyond. The Cunningham Group is partnered with the Marine Corps Warfighting Lab to identify and mature promising science and technology efforts from across the spectrum of aviation disciplines. The Cunningham Group also serves as a direct link to industry partners, academia, and defense research agencies. Participation in studies, planning teams, and wargames across DoD helps inform the team toward future concepts.

Methodology used to evaluate current and future capabilities:

Define the missions / capabilities Marine Aviation should perform in support of the Stand-In-Force:

- Six functions of Marine Aviation as defined in MCWP 3-20, as well as the critical enabler of aviation ground support (AGS).
- Define key characteristics of the pacing threat
- Define key characteristics of the operating environment
- Evaluate current and future platforms based on 4 criteria:
 - Lethality
 - Survivability
 - Interoperability
 - Sustainability

The CG is the nucleus of the department and is responsible for maintaining the aviation vision; Cunningham Group acts as liaison to Combat Development and Integration for enacting aviation force development across the Marine Corps and the national security enterprise. The Department of Aviation coordinates actions through the CG that maximize support to key events and outputs of the Marine Corps force development process. In its roll of developing and maintaining the aviation vision, the CG processes external information to create a shared knowledge within the department that is communicated internally and externally through the Aviation Campaign



THE CUNNINGHAM GROUP ORGANIZATION

The CG is organized into three divisions that support assessing and planning for the development of Marine Corps aviation: Aviation Future Capabilities; Aviation Strategy and Wargaming; and Aviation Operational Readiness. The CG pursues technology and concepts that make Marine Corps aviation more *survivable, lethal, effective, and interoperable* in the future operating environment.

CUNNINGHAM GROUP FUTURE CAPABILITIES DIVISION

The Cunningham Group Future Capabilities Division acts as primary interlocutor between Aviation and Marine Corps Warfighting Laboratory Science and Technology, to ensure aviation S&T is developed in parallel with other capabilities. This division focuses on the development of future aviation capabilities and integrates across the NAE S&T community to: 1. Adapt relevant technologies for aviation platforms and systems, 2. Inform the development of technology for future aviation platforms and systems. The objective of the Future Capabilities Division is to develop survivable, sustainable, lethal, and interoperable capabilities that perform the six functions of Marine Aviation and four types of Maritime Aviation Operations to support the future operational environment.

Central to this effort is the creation of an aviation science and technology program that is sufficiently resourced and structured to transform aviation warfighting capabilities. In accordance with MCWL S&T priorities, the aviation S&T technical framework is founded on future platforms, advanced weapons, optimized sensors,

interoperable communications, interface design, training and simulation, the human cognitive domain, and open system architectures. Each foundational element is focused into discrete technology support areas that take advantage of sustainable leap ahead warfighter capabilities. Driven to innovate, this division will identify RDT&E investment opportunities to mature, develop, and accelerate game-changing technology. Close partnership with technology development groups like OSD R&E, DARPA, ONR, other government laboratories, and industry is paramount to the convergence of capability needs to an actionable timeline. The CG Future Capabilities Division will integrate into the Marine Corps capability development process and learn through the analytical framework by collaborating across the institution to support wargaming events; modeling, simulation and analysis activities; experimentation and demonstration events; the resource planning, programming, budgeting cycle, and fleet interactions.



THE CUNNINGHAM GROUP ORGANIZATION

CUNNINGHAM GROUP STRATEGY AND WARGAMING DIVISION

The CG Strategy and Wargaming (CG S&W) division connects with joint service strategy development bodies, plans, and wargaming to inform aviation concepts of employment. CG S&W is the primary input to the Department of Aviation regarding service and joint concepts, doctrine, and plans that inform the development of Marine Corps aviation.

The CG S&W is responsible for characterizing and updating the future operating environment to refine DCA's vision over time. As the aviation vision changes so will the Aviation Campaign Plan and the Department's operational approach for achieving the objective future force.

Since the FY19 AVPLAN, the force development outlook and concepts of employment for Marine Corps aviation underwent significant change in accordance with FD2030 and the CPG. An aviation integrated planning team (IPT) was conducted to ascertain the character of the future aviation force in support of the SiF, alongside other IPTs related to Marine Corps warfighting functions. FY21 tested Marine Corps aviation in service-level wargames focused on surface warfare, peer anti-air warfare campaigns, aviation in support of logistics in the littorals, the future three-ship Amphibious Ready Group and 2030 MEU, the future infantry battalion, a fully informed game on Operations in the Information Environment, and aviation in support of the Marine Littoral Regiment. FY22 began with

a fully-informed aviation-specific wargame that was hosted at MAWTS-1 and FY22 will tackle numerous service level wargames aimed at further analysis of the MLR and distributed logistics and sustainment.

CUNNINGHAM GROUP OPERATIONS AND READINESS

The Operations and Readiness division of the CG (CG O&R) maintains a current snapshot and future prediction of Marine Corps aviation's operational readiness and posture. CG O&R is vital to assessing Marine Corps aviation's force development initiatives and this is the divisions primary input to aviation force development.

Additionally, the CG O&R division integrates with HQMC Plans, Policy, and Operations to maintain awareness of the daily global posture of Marine Corps aviation, and also integrates with the Combat Development Directorate to inform the development of aviation mission essential tasks.

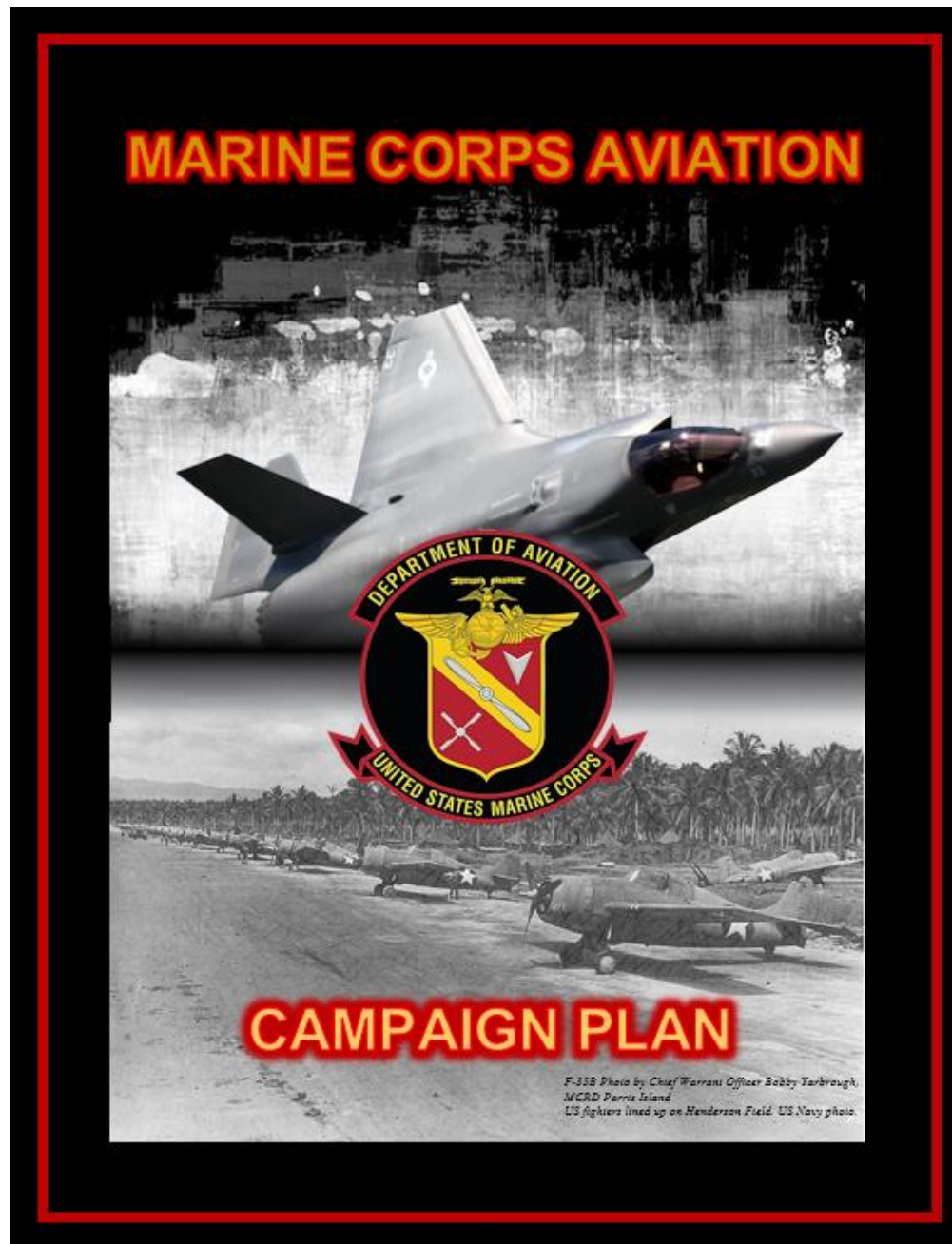
AVIATION CAMPAIGN PLAN

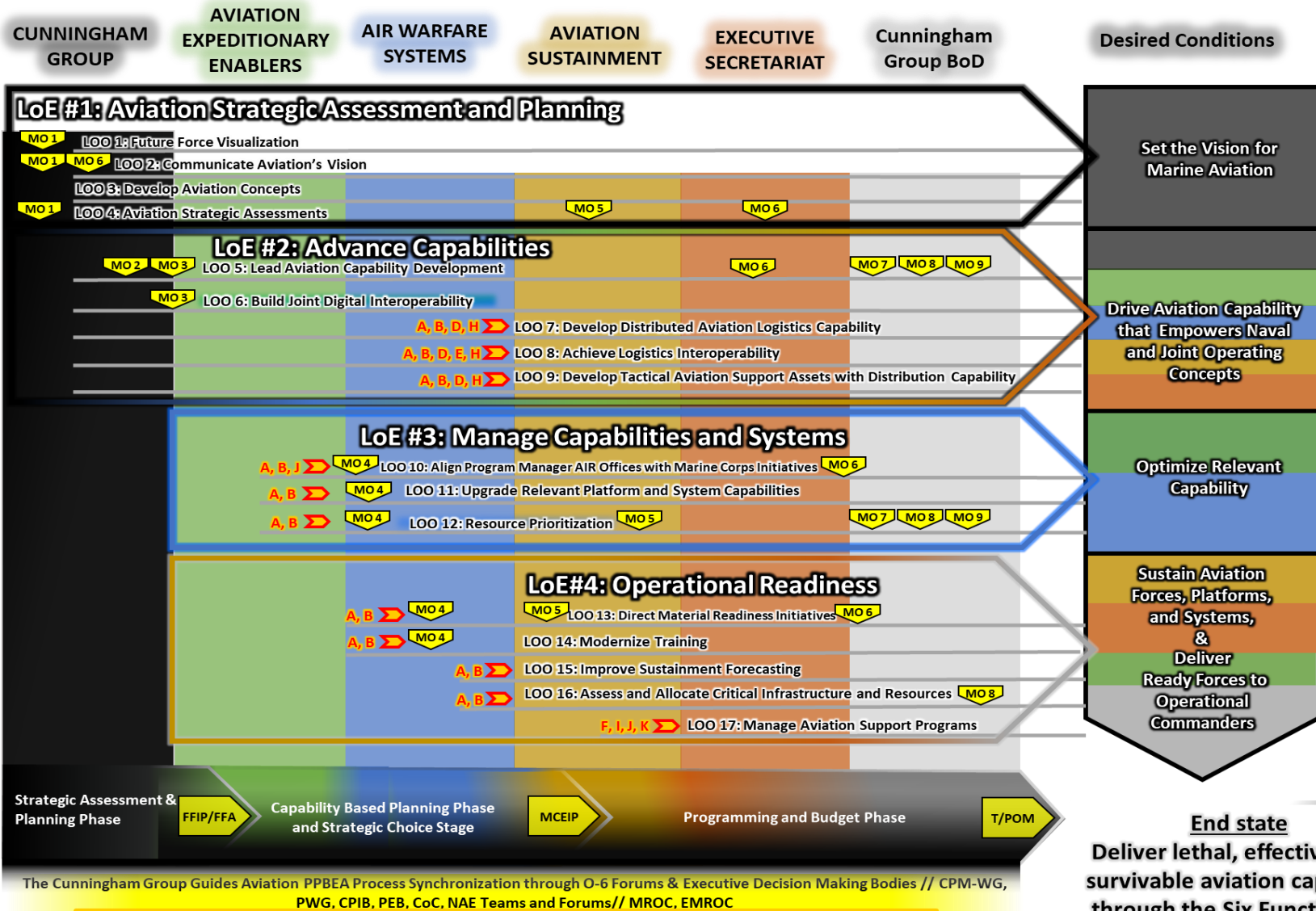
The Department of Aviation Campaign Plan (DACP) outlines the Deputy Commandant for Aviation's vision and direction for aligning the department to the force development process and synchronizing aviation support to key events in this process. The re-organized Department of Aviation is designed to provide maximum support to Marine Corps force development, integrate across Headquarters Marine Corps, and achieve the CMC's vision of the future force.

This vision is the center-piece of the DACP and it distills national and service-level strategic guidance into a refined trajectory for developing Marine Corps aviation. The National Security Strategy focuses on denying America's adversaries achievement of their strategic goals through the use of force or other forms of aggression. The CPG and FD2030 envision a naval expeditionary force (NEF) designed for executing America's denial strategy through the Navy's *Distributed Maritime Operations* (DMO) concept, the corresponding Navy and Marine Corps concepts of *Littoral Operations in a Contested Environment* (LOCE) and *Expeditionary Advanced Base Operations* (EABO), and the Marine Corps' *A Concept for Stand in Forces* (SiF). Under these concepts, naval forces are equipped and distributed as part of the NEF to create the virtues of mass without the vulnerabilities of concentration.

Marine Corps aviation contributes to massing distributed effects across the NEF through the Six Functions of Marine aviation and, in the future, the four types of maritime aviation operations: anti-submarine warfare (ASW), surface warfare (SUW), information operations, and intelligence, surveillance, reconnaissance (ISR) missions. Marine Corps aviation must pursue maritime aviation capabilities and new methods for sustaining stand-in, expeditionary airpower. Like the future ground force, the stand-in ACE must operate distributed, mobile, low-signature, maximize its self-sustainment, and expand the use of uncrewed systems. The DACP is an evolving guide for achieving future aviation capability through collaboration, integration, coordination, and support across the activities within the Marine Corps Force Development System (MCFDS). The Department of Aviation uses the DACP to lead capability and concept development for shaping the ways that Marine Corps aviation will employ to fulfill the service's strategy. The DACP's operational approach is the Department of Aviation's plan to actualize the capabilities and operational concepts encompassed in the aviation vision.

The Department of Aviation Campaign Plan is available at <https://usmc.sharepoint-mil.us/sites/DCA>





- Major Objectives**
1. Inform IPTs
 2. Inform MET/METL Workshops
 3. Inform CPM WGs
 4. T/M/S Teams Engagement
 5. NAE Air Board
 6. Strategic Communication
 7. Execution Year Strategic Choices
 8. Inform POM WG
 9. Inform CPIB/CPRB

- Essential Tasks**
- A. Aviation Assessments
 - B. Material Readiness
 - C. Identify Aviation Training Requirements and Policy
 - D. Inform Service Development of Aviation Related Technology
 - E. Advise leaders on the application of Marine Corps aviation and inform aviation warfare concepts and doctrine development.
 - F. Activities Directed by United States Law. Adjudicate Flight Status Suitability Boards and direct the Air Support Control Office.
 - G. Represent the United States Marine Corps on Aviation Matters.
 - H. HQMC Unity of Effort.
 - I. HMX-1 and Operational Tasking of Non-Executive Aircraft.
 - J. Operational Control of VMX-1.
 - K. Through TECOM, Coordinate with MAWTS-1 to Inform Aviation Warfighting Concepts and Innovation.

End state
 Deliver lethal, effective, and survivable aviation capability through the Six Functions of Marine Aviation and the four types of Maritime Aviation operations, to deter escalation by equipping the stand-in-force with credible lethality, agility, and information.

The Department of Aviation Campaign Plan Operational Approach



CSG-21 at sea with HMS *Queen Elizabeth*, 2021

A close-up photograph of a Marine in flight gear, including a green helmet with a blue and white striped patch and a green oxygen mask. The Marine is focused on working on the engine of a military aircraft. The background shows the complex machinery and structure of the aircraft's engine compartment.

Marine Aviation Readiness, Manpower, Logistics

- 2.1 Aviation Readiness
- 2.2 Aviation Manpower
- 2.3 Aviation Logistics

SECTION 2



A U.S. Marine assigned to VMGR-152 “Sumos” offloads a High Mobility Artillery Rocket System (HIMARS) from a KC-130J Hercules aircraft during Exercise TALISMAN SABRE

READINESS FOR COMBAT

CUNNINGHAM GROUP OPERATIONS AND READINESS

Marine aviation's focus is building readiness for combat and ensuring AvPlan alignment with the *Commandant's Planning Guidance*. Pillars of our readiness strategy include programs and initiatives to sustain and modernize the platforms we have, develop efficiencies to support Marines in the maintenance departments, and ensure all Marine aviation platforms and systems are fully integrated into the future MAGTF.

For context: in the years leading up to FY16, Marine aviation experienced significant challenges to readiness, with few platforms achieving over 60% mission capable (MC) and some below 50%. Through multiple independent readiness reviews and engagement through the entire naval aviation enterprise, Marine Aviation launched the comprehensive readiness recovery plan in late 2014 with the goal of achieving 75% MC by FY21. This plan led to significant changes in funding strategies and served as a catalyst to increase aviation resourcing with the first major increase occurring in FY17.

We have executed increased readiness enabler account funding since FY16: an 84% increase in Operations and Maintenance – Navy (OMN) and 74% across all of the big five enabler accounts. This investment and focused effort facilitated multiple initiatives to improve material readiness across every type/model/series (TMS) such as Depot Readiness Initiative (DRI), CH-53E Reset, and Light Attack Aircraft Management Plan (LAAMP), among others.

The combination of all our readiness initiatives has already achieved measurable results and we continue to see an upward trend in material and operational readiness across the fleet. Current Marine aviation readiness recovery efforts aim at achieving a 75% mission capable (MC) goal and squadrons with a training-level 2 (T-2) as part of the readiness recovery plan.

Two exceptions to this increase in readiness are KC-130J, which continues to be stressed by significant operational demand, but still maintained a 60% MC rate average across FY21; and F-35B, which decreased from 67% to 63% due to issues impacted by maintenance and supply.

READINESS FOR COMBAT

CUNNINGHAM GROUP OPERATIONS AND READINESS

With more assets available for training, every TMS experienced an increase in hours per crew per month, which supports an average T-rating across the fleet of 1.6, demonstrating effective management of the Flying Hour Program. Though T-ratings are only a piece of readiness, they indicate a commander's ability to apply their resources toward training for combat. The Marine Corps and NAE investment in Marine Aviation allowed our force- in-readiness to do exactly that: more effectively train for combat. A sustained commitment to these funding strategies will ensure that we remain ready for future competition or conflict.

Commensurate with material readiness improvements, we will continue to provide combat ready, proficient aircrews, armed with knowledge and experience gained through adequate flight hours and training resources. Since 2019, we conducted extensive reviews of Air Combat Element Mission Essential Tasks (METs) to re-align like METs across related platforms and ensure adherence to the Universal Joint Task List. Each flying community's Training and Readiness Manual was revised, and we budgeted flight hours to support training to our METs.

In addition to tangible gains in readiness in our squadrons, changes to the Marine Corps Readiness Reporting order adjusted how we report against output standards to more accurately project our training readiness to the Marine Corps and Joint Staffs. The implementation of baseline versus advanced output standards, as well as changes to reporting core model minimum requirement flight leadership standards now allows Marine Aviation to better represent the effectiveness of our training plans in generating crews that are ready for combat. Additionally,

enabling aviation units to report R-ratings against a 30-day average rather than a 24-hour snapshot gives a more accurate depiction of material readiness to better inform the NAE on how to energize the system to get squadrons the sustainment support they need.

With a significant portion of Marine aviation experiencing transition or sundown, throughout all TMS we will employ "best-of-breed" inventory management initiatives to keep squadron aircraft supply at designated primary authorized aircraft (PAA) levels. Concurrent with sustainment of our current platforms, we are working on procurement and modernization efforts to ensure that we are ready to accomplish our mission, on time, and relative to our pacing threat with new capabilities.

Additionally, we continue working with the Deputy Commandant for Manpower and Reserve Affairs to manage manpower capacity to fly and maintain our platforms to deliver quality support to the joint and maritime force. As some communities are shrinking, the opportunity to lateral move into new MOSs and continue to serve in Marine aviation is critical to maintaining our competitive advantage in the air.

These initiatives are highlights of a comprehensive readiness framework that continues to evolve to meet new demands and challenges. While short term success can be measured in material condition improvements and aircrew training gains, continued and synchronized coordination with our industry partners, depots, and supply chains must persist with adequate and stable funding. This coordinated effort, combined with operating within the service's maintenance capacity, ensures the Marine Corps' ability to meet and sustain a material condition level that improves our combat lethality and achieves the service's Title X requirements as the force in readiness.

READINESS FOR COMBAT

FUTURE READINESS CONSIDERATIONS

As we work to size our population of people and aircraft in accordance with FD2030 and fiscal constraints, we are continuing to ensure a sufficient parts supply. Marine aviation is experiencing a shift from high percentages of Non-Mission Capable - Supply (NMCS), to higher percentages of NMC - Maintenance (NMCM) since adequate parts supplies are awaiting aircraft availability and maintainer capacity for installation and testing. With consistent future funding and coordinated aircraft flight schedule and maintenance management, NMCS and NMCM rates will both steadily decline.

The emergence of tools and analytics such as the Maintenance Capacity Model (MCM) will help increase maintenance department efficiencies by optimizing how we employ the Marines we have available for work and thereby reducing NMCM, informing commanders and allowing them to drive efficiency. Additionally, byproducts of MCM's detailed analysis will ensure our Marines have the equipment to properly maintain aircraft, incentivize retention of our experienced and qualified maintenance Marines, and improve the operations-maintenance balance of squadrons.

Marine Aviation is conducting an extensive review of the Fleet Replacement Squadron (FRS) enterprise to identify areas where we can improve effectiveness in pilot and aircrew production to meet fleet requirements. In our review, we are analyzing the current command and control structure, governing

documents, maintenance and sustainability models, and basing locations to identify a potential path forward toward an optimized FRS training continuum. Our desired endstate is a pathway to a modern, 21st century training pipeline that produces aircrew capable of meeting future operational requirements.



As the Marine Corps continues to execute Force Design 2030, we are experiencing challenges driven by aviation capacity being reduced without relief from operational commitments. Multiple communities will be stressed over the coming years, resulting from either divestment or transition. This is a critical period for the Marine Corps and for Marine Aviation. We must protect the progress that we have made over the past several years in increased readiness in order to sustain our competitive advantage over our adversaries.

READINESS FOR COMBAT

The Marine Corps Flying Hour Program (FHP) provides for the operation, maintenance, and training the three Marine Air Wings, Fleet Air Support (FAS) aircraft, training squadrons, Reserve forces, and various other enabling activities. FHP requirements are re-baselined annually, driven primarily by the operational employment plans and evolving presence requirements for both the Navy and Marine Corps.

Additional requirement changes are driven by fuel prices, repair cost changes, and key contract modifications. FHP Requirement also incorporates direct maintenance support contracts, Center for Naval Analyses- derived flight hour and aircraft aging factors, service force structure changes, undergraduate aviation training curriculum and throughput plans, and Logistics Engineering Change Proposals.

Flying Hour Requirement by Type/Model/Series

AH-1Z	22275.0
AV-8B	9647.0
CH-53E	19450.0
CH-53K	800.0
F-35B	13900.0
F-35C	2800.0
FA-18C	12533.0
FA-18D	6667.0
KC-130J	20100.0
MV-22B	36390.0
UH-1Y	19170.0
Total	163732.0

READINESS FOR COMBAT

FYDP FLIGHT HOUR PROGRAM FUNDING

FYDP FHP Funding							
Schedule	FY22*	FY23	FY24	FY25	FY26	FY27	FYDP
TACAIR	2168.33	2345.58	1975.89	1840.202	1860.733	1882.923	12073.66
Fleet Air Training	415.922	358.477	271.224	269.371	287.44	247.207	1849.641
Fleet Air Support	90.241	98.585	113.685	116.444	122.973	123.486	665.414
Reserves	183.282	182.04	167.261	177.149	182.481	178.035	1070.248
CNATRA	286.402	277.014	282.545	299.481	310.239	316.972	1772.653
Flight Other	344.917	423.91	424.105	456.384	506.611	506.666	2662.593
UAS	14.479	99.97	182.597	287.133	93.588	98.025	775.792
Total (\$M)	3503.58	3785.57	3417.31	3446.164	3364.065	3353.314	20870
*FY22 Numbers are from Enacted Budget, FY23 and out are PB-23 Controls							

AVIATION MANPOWER

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

PRODUCTION

Marine Aviation must balance aircrew and maintainer inventories to ensure the operating forces maintain combat readiness while adjusting to Force Design 2030 divestments and changes. To meet production requirements, the accession process, undergraduate flight school training, and capacity at fleet replacement squadrons must be properly managed and resourced.

Additionally, HQMC Aviation is coordinating ongoing efforts to maximize efficiencies in the pipeline and seek opportunities to increase throughput wherever possible, without compromising the quality of training.

READINESS

Proper resourcing, depot maintenance throughput, flight line entitlement, and maintenance manning are all factors that contribute to aviation readiness. HQMC Aviation will continue to support TFSD and M&RA to conduct periodic force structure reviews, promote aviation retention incentives and bonuses, and monitor staffing health to ensure the right Marine

with the proper training and qualifications makes it to the right unit on time.

STAFFING

M&RA continues working closely with HQMC Aviation to ensure appropriate staffing in the fleet squadrons, maintaining support to legacy operations and the ongoing transition to new T/M/S aircraft. Further, emphasis now is on increasing staffing in pilot pipelines with instructor pilots to maximize production. Both commands will continue to execute in a manner that best supports the fleet and USMC as a whole.

The charts on the following pages show the current state of officer and enlisted manning across Marine aviation. Abbreviations of those charts will be as follows:

- ATC - Air Traffic Control
- Avn - Aviation
- BS - Boat Spaces
- F/W - Fixed Wing
- GAR - Grade Adjusted Recapitulation Report
- IMA - Intermediate Maintenance Avionics
- LAAD - Low Altitude Air Defense
- METOC - Meteorology and Oceanography
- OMA - Organization Maintenance Avionics

AVIATION MANPOWER

MARINE AVIATOR INITIAL PRODUCTION REQUIREMENT

FY	CH-53E	AH-1Z	UH-1Y	KC-130	MV-22	F/A-18	AV-8B	F-35B	F-35C	Total
2020	48	48	40	32	96	36	16	26	2	344
2021	50	48	40	35	102	36	16	26	4	357
2022	50	40	33	38	92	26	10	40	6	335
2023	46	40	30	38	85	22	10	40	8	319
2024	46	40	30	46	85	12	6	48	12	325
2025	46	40	30	50	85	8		56	18	333
2026	46	40	30	50	85	8		57	18	334
2027	46	40	30	52	85	8		59	16	336

AVIATION MANPOWER

Aviation Officer Health (Mar 2022)						
MOS	Active			Reserve		
	GAR	On-Board	%	GAR	On-Board	%
7509 (AV-8)	185	156	84%	23	21	91%
7518 (F-35)	498	197	40%	5	12	240%
7523 (F/A-18)	326	234	72%	71	57	80%
7556/57 (KC-130)	377	324	86%	97	57	59%
F/W Pilot Total	1386	911	66%	196	147	75%
7532 (MV-22)	986	850	86%	84	68	81%
7563 (UH-1)	369	389	105%	71	43	61%
7565 (AH-1)	503	541	108%	101	76	75%
7566 (CH-53)	616	558	91%	39	51	131%
R/W & TR Pilot Total	2474	2338	95%	295	238	81%
7315 (RQ-21)	154	125	81%	3	5	167%
7318 (MQ-9)	63	38	60%			
UAS Pilot Total	217	163	75%	3	5	167%
7525 (NFO)	68	119	175%	11	6	55%
6002 (Aircraft Maintenance)	254	303	119%	17	24	141%
6602 (Aviation Supply)	216	248	115%	19	22	116%
7202 (Air Command and Control)	197	203	103%	8	30	375%
7204 (LAAD)	69	75	109%	3	1	33%
7208 (Air Support)	162	191	118%	28	34	121%
7210 (Air Defense Control)	122	116	95%	13	13	100%
7220 (Air Traffic Control)	93	83	89%	6	5	83%

Restricted Officer Health (Mar 2022)								
MOS	Active					Reserve		
	CWO		LDO		%	CWO		%
	On-Board	GAR	On-Board	GAR		On-Board	GA R	
5902 (Electronic Maint)			27	31	87%			
5910 (Radar Officer)	14	16			88%	1	1	100%
5950 (ATC Maint)	25	18			139%	1	1	100%
5970 (Data systems)	16	20			80%	3	2	150%
6004 (A/C Maint. Engineer)	99	92	44	43	106%	1	2	50%
6302 (Avionics Officer)	87	79	40	44	103%	5	5	100%
6502 (Ordnance Officer)	66	59	37	40	104%	2	2	100%
6604 (Avn Supply Ops Off)	44	44			100%	3	7	43%
6802 (METOC Officer)	24	24	9	9	100%	2	3	67%
7002 (Exp Airfield & ES Off)	38	40			95%	4	3	133%
RESTRICTED TOTALS	413	392	157	167	102%	22	26	85%

TACAIR TRANSITION

Due to the transition to the F-35, legacy platform pilot and maintainer career paths are tied to current and future F-35 squadrons. Current transition processes to the F-35 community for pilots and maintainers remain open. M&RA continues phasing lateral moves into the new community to match HQMC Aviation's transition plan. The USMC needs key leadership and experience to remain with the legacy squadrons through sundown, at which time opportunities to lateral move to the F-35 or potentially another MOS of the individual's choice based on the needs of the Marine Corps will be available. Instructor pilots are a continuous requirement and provide a place for those with fleet experience to shape the future generations of Marine naval aviators.



DANGER

EJECTION
SEAT

DANGER

WARNING - DO NOT CLIMB
WITHIN 3 INCHES OF CANOPY

AVIATION MANPOWER

AVIATION BONUS AND KICKERS

The Aviation Bonus and Maintenance Kicker special pays have provided incentive for both officers and enlisted in certain grades and communities, which have helped to stabilize staffing.

AVIATION BONUS (AVB) PILOT TAKE-RATES

In FY21 the AVB applied to eight communities in various amounts and was divided into three separate categories; fixed wing, tiltrotor, and rotary wing. Each category contained groups based on YCS; less than 12 YCS, between 12 and 14 YCS, and for fixed wing 14 YCS to in-zone for Lieutenant Colonel.

The fixed wing bonus was between \$35k - \$20k, dependent on YCS group. The tilt-rotor bonus was between \$25k - \$20k YCS dependent. The rotary wing bonus was between \$15k - \$10k YCS dependent.

Take-rates decreased for FY21, partially due to changes made in the eligibility which limited the amount of first look individuals who previously did not have a chance to apply for a bonus, and a greater number of individuals choosing to keep their career options in the near term open. The FY22 Aviation Bonus is identical to the FY21 bonus with minor changes. Additional incentives are being analyzed for applicability, both monetary and non-monetary.

AVIATION MAINTENANCE KICKER

The FY21 Maintenance Kicker applied to four specific NMOSs (6012, 6016, 6017, 6018) from E-4 through E-7, which contained several eligibility zones. The \$20,000 kicker was paid in addition to any traditional PMOS SRB amount and required a reenlistment for 48 months, with the first 24 months spent in a designated operational MCC.

In total 509 Marines accepted the FY21 Maintenance Kicker, which resulted in an 40% overall take-rate of the eligible reenlistment population. Of note: the timeframe included July 2020 to September 2021 to allow Marines' timely submission of reenlistment packages.

AIR TRAFFIC CONTROL (ATC) KICKER

The FY21 ATC Kicker had a similar construct to the maintenance kicker, but focused on the 7252, 7253, and 7254 NMOSs. In total 37 Marines accepted the ATC Kicker, which resulted in a 34% take-rate of the eligible reenlistment population.

AVIATION MANPOWER

Aviation Enlisted Health						
OCC FIELDS MAR 2022	Active			Reserve		
	GAR	On-Board	% of GAR	GAR	On-Board	% of GAR
59XX (Electronics Maintenance)	1435	1223	85%	181	129	71%
60XX (Aircraft Maintenance)	4129	4208	102%	243	222	91%
61XX (RW Maintenance)	5150	4954	96%	302	288	95%
62XX (FW Maintenance)	3306	3036	92%	208	150	72%
63XX (Avionics OMA)	3188	3131	98%	165	177	107%
64XX (Avionics IMA)	2018	1935	96%	105	116	110%
65XX (Aviation Ordnance)	2378	2247	94%	134	143	107%
66XX (Aviation Supply)	1996	1931	97%	181	161	89%
68XX (Aviation Weather)	344	314	91%	37	23	62%
70XX (Airfield Services)	1957	2002	102%	262	246	94%
72XX (Air Control/Support)	2246	1712	76%	195	130	67%
73XX (UAS Enlisted Operators)	238	177	74%	1	14	1400%
TOTALS	2838	26870	95%	2014	1799	89%

FIRST TERM ALIGNMENT PROGRAM (FTAP)								
OCC FIELD	Lat Moves	FTAP Exec	Remain BS	FY22 Quota	FY22 % Exec	FTAP 21 Exec	FY21 Quota	FY21 % Exec
59XX	0	58	20	78	74%	43	61	70%
60XX	1	160	21	173	92%	188	186	101%
61XX	0	179	17	185	97%	183	186	98%
62XX	79	184	21	195	94%	128	163	79%
63XX	49	135	35	166	81%	104	133	78%
64XX	1	88	2	93	95%	69	73	95%
65XX	1	104	0	102	102%	125	117	107%
66XX	0	106	0	93	114%	88	90	98%
68XX	0	16	0	16	100%	11	11	100%
70XX	6	83	0	79	105%	97	90	108%
72XX	8	82	0	82	100%	81	82	99%
73XX	3	8	0	8	100%	10	9	111%
TOTALS	148	1203	116	1270	95%	1127	1201	94%

SUBSEQUENT TERM ALIGNMENT PROGRAM (STAP)							
OCC FIELD	Zone A/B Exec ¹	Zone C Exec ²	Zone D Exec ³	STAP Exec	STAP Remain	STAP Quota	STAP % Exec
59XX	29	15	14	58	1	59	98%
60XX	84	53	54	191	-1	190	101%
61XX	108	55	65	228	3	231	99%
62XX	62	43	37	142	-5	137	104%
63XX	56	36	44	136	4	140	97%
64XX	43	27	19	89	-3	86	103%
65XX	46	17	26	89	-7	82	109%
66XX	41	34	17	92	-2	90	102%
68XX	2	7	10	19	-2	17	112%
70XX	35	29	25	89	-5	84	106%
72XX	35	23	30	88	-3	85	104%
73XX	1	1	3	5	6	11	45%
TOTALS	542	340	344	1226	-14	1212	101%



MARINE AVIATION SUSTAINMENT PLAN

INITIATIVES DRIVING CAPABILITY AND READINESS

After significant investments to correct shortfalls identified in Independent Readiness Reviews, Marine Aviation has realized tangible and measurable improvements from these targeted initiatives. In order to sustain and improve readiness in the future, a focus on improving processes must be explored. Strong maintenance departments have displayed the ability to generate the required number of materially sound, healthy aircraft to enable our aircrews to be successful in training and in combat, setting conditions for an “operations and maintenance balance.” A disciplined and repeatable process must be replicated across Marine Aviation to ensure all maintenance departments, supply departments, squadrons, and groups are manned and equipped with the necessary tools and processes to achieve the same level of success as our “rock star” performers.

Force Design and Type/Model/Series transitions will require both Program Office and Naval Aviation Enterprise (NAE) leadership to cast a critical eye on aircraft inventories and keep the “best of breed” aircraft on the flight-line to support the warfighter. Working groups in the F/A-18A-D, MV-22B, CH-53E, AH-1Z, and UH-1Y are working diligently to determine what aircraft transition and what aircraft will support a reduced squadron footprint in 2030. HQMC Aviation is continuing to expand the policy of Marine Aviation Logistics Squadrons’ (MALS) performing the role of Aircraft Reporting Custodian for aircraft in off-site depot locations and in long-term preservation. As the role of the MALS adapts to support the transition from legacy platforms, HQMC Aviation acknowledges that Force Design necessitates a holistic review of of the MALS’s contributions to the overall aviation maintenance effort. Additionally, a troop to task review will be required to identify the most efficient and effective way of manning the MALS to best support future platforms, systems, concepts, and strategic locations such as Guam.

Additionally, manpower constraints and fiscal responsibility require a pathway to a cohesive contract maintenance support framework that targets specific tasks such as flight-line preservation, long-term-down rebuilds, and support of Fleet Replacement Squadrons. This framework will allow our maintenance departments to apply organic maintenance capacity more efficiently to sustain and enhance readiness. Furthermore, HQMC Aviation continues to champion an effort to have NAVAIR serve as the contracting authority for naval aviation which will ease the burden of awarding contracts and speed services to the fleet.

HQMC Aviation will continue to rely on proven management techniques and champion new initiatives to **Improve Processes to Increase Readiness**. These initiatives include the Naval Aviation Enterprise, Naval Sustainment System – Aviation (NSS-A), Maintenance Capacity Model (MCM), and Corrosion-Maintenance Readiness Team. New initiatives are not fast or easy and often require culture change...culture change takes time and commitment from leadership at all levels.



MARINE AVIATION SUSTAINMENT PLAN

READINESS RECOVERY

The mission of the NAE is to sustain required current readiness and advance future warfighting capabilities at the best possible cost. The NAE exists as a forum naval aviation stakeholders can use to share information, discuss challenges and barriers to achieving readiness, and ensure resources are used effectively. This single framework for facilitating collaboration, transparency, engagement, information-sharing and process improvements among its various stakeholders. Within the NAE, and specifically within CR, is the NSS-A process.

The NSS-A support pillars include end-to-end supply chain reform; engineering reform; Fleet Readiness Center reform (to include the Intermediate and Depot levels of maintenance); governance, accountability, and organization; the stand-up of a Maintenance Operations Center for Aircraft-On-Ground (MOC/AOG); and Organizational-Level Maintenance Management (OLMM) including several tool sets to manage maintenance processes. OLMM is being fielded in the MV-22B community after success in several Navy Type Wings. MOC/AOG and OLMM tools, including the Maintenance Planning Tool and turnaround time metrics, require input from maintenance managers and leaders at the Wing, MAG, and squadron. The future goal of Marine Aviation is to implement all T/M/S aircraft into the NSS-A process to fully benefit from all of the support pillars available.

The Maintenance Capacity Model was developed by aircraft maintenance experts throughout the Marine Corps to measure maintenance capacity and expand maintenance personnel touch-time. It relies on understanding what has consistently delivered aircraft readiness in the past and identifying appropriate behaviors to make "best-



practices" measurable and repeatable. The MCM measures behaviors that are universally applicable to all type/model/series aircraft and actionable by commanders and maintenance managers at every level. MCM is a tool that empowers leaders to measure the ability of any unit to effectively employ workers by monitoring the number of workers engaged in daily maintenance and the direct maintenance man-hours per worker per workday. MCM measures direct maintenance man-hours per flight hour (DMMH/FH) at the work center level to balance production capacity of the work centers with planned flight hours of the command.

After the initial testing in 2019, Marine Aircraft Wings continue to evaluate how to best employ MCM across the fleet. Thus far, at least eight different squadrons across Marine aviation have achieved marked improvements in daily touch time of over 1,000 hours, stabilized mission capable rates, and achieved their planned flight hours. To validate these gains are uniquely associated with MCM, an independent study has been initiated.

MARINE AVIATION SUSTAINMENT PLAN

READINESS RECOVERY

The Depot Readiness Initiative (DRI) is a tool created to allow flying squadron maintenance departments to avoid hundreds and sometimes thousands of man-hours performing required deferred organizational level maintenance upon an aircraft's return from a depot event. DRI addressed organizational-level maintenance tasks such as calendar inspections, hourly inspections, discrepancy maintenance actions, and the incorporation of technical directives. With future funding constraints on the horizon, DRI may shift focus towards flight critical discrepancies and limit the scope of organizational scheduled maintenance. As a testament to DRI's effectiveness, over 300 H-1's, CH-53E's, F/A-18's, and MV-22's - at a cost of approximately \$20-25 million annually - have been returned to the squadrons allowing them to recapitalize man-hours.

The CH-53E Reset program enabled our aging fleet of Super Stallions to stay in the fight by inspecting, rebuilding, and restoring the aircraft to a full mission capable status. Reset aircraft provide far greater monthly flight hour generating capacity than non-Reset aircraft, cost less to operate, and help to facilitate an operations and maintenance balance. Over the past six years, the Reset program operated at five sites, both CONUS and OCONUS, and completed 45 of the original planned 138 aircraft. While recent turnaround time has reduced flight line availability, the return on investment is nearly a ten percent increase in mission capable rates, five percent increase in utilization, and a seven percent decrease in non-

mission capable supply rates. The Reset program, in conjunction with our fleet of talented maintainers, will extend the life of our CH-53E's through our transition to the King Stallion.



MARINE AVIATION SUSTAINMENT PLAN

EQUIPPING THE FLIGHT LINE/KEEPING PACE WITH EMERGING TECHNOLOGY

As Marine aviation transitions to new aircraft and focuses on supporting the maintainer, updating equipment and tools utilized by our Marines is essential to improving productivity and professionalizing the workforce. As stated in the Commandant's Planning Guidance, "the Marine Corps can no longer accept the inefficiencies inherent in antiquated legacy systems that put unnecessary burden on the warfighters."

Removing time constraints to ensure Marines spend more time maintaining aircraft and conducting component repair can be achieved through innovative solutions and emerging technology. New and more reliable Individual Material Readiness List (IMRL) support equipment is being delivered to the fleet squadrons possessing either new or legacy aircraft. The new A/F27T-12 Hydraulic Test Stand, the improvement to the F/A-18 Servocylinder Test Station (STS), and new Short Airfield for Tactical Support (SATS) Loader are being delivered to the fleet to fix aircraft and components more efficiently.

Despite COVID-19 restrictions on travel during the last two years, the Marine Corps has made significant progress installing Wi-Fi on Marine Corps Air Stations. Three of the four MAW's have functioning Wi-Fi networks in hangar spaces, and multiple T/M/S Portable Electronic Maintenance Aids (PEMA) are Wi-Fi capable. This advancement allows easier on-the-go access to



Naval Aviation Logistics Command Management Information System (NALCOMIS) Optimized Organizational-Level Maintenance Activity (OOMA) and maintenance publications, to include Interactive Electronic Technical Manuals (IETMs).

MARINE AVIATION SUSTAINMENT PLAN

EQUIPPING THE FLIGHT LINE/KEEPING PACE WITH EMERGING TECHNOLOGY

ADDITIVE MANUFACTURING (AM)

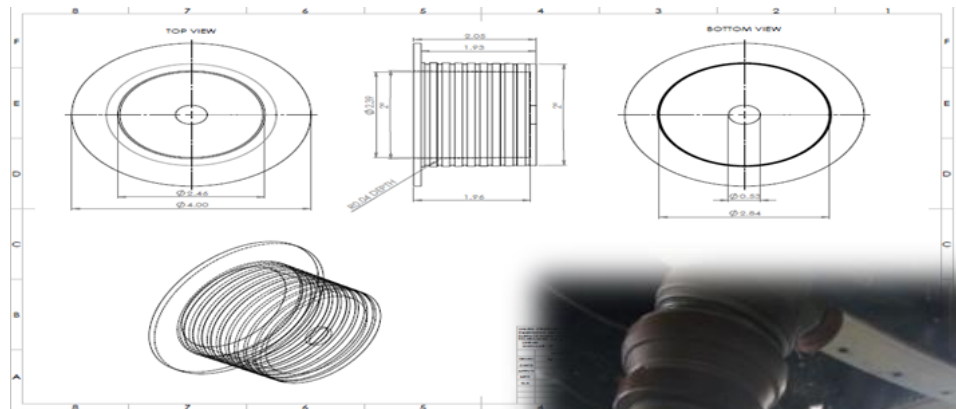
Additive technologies, enhanced computing capability, updated software systems, laser ablation, and unmanned aerial and ground delivery systems are only a few of the emerging technologies being resourced that will enhance our Marines' ability to conduct safe, efficient, and effective maintenance while increasing maintenance capacity on aircraft and aeronautical components.

FY-22 continues to mature baseline standardization for Additive Manufacturing by building on the previous year's accomplishments:

- ASB collaborated with HQMC Installations and Logistics to author the Marine Corps Order on Additive Manufacturing, which solidified guidance for additive manufacturing employment across the service.
- The Training and Readiness Standard was established and published in the Advanced Skills Management System (ASM).
- The 6044 NMOS was established and published in the T&R Manual.
- Work center 550 was established and solidified as the AM work center by CNAF policy.
- The Preliminary Navy Training System Plan (NTSP) N98-NTSP-A-50-2001/I of October 2021 for the NAVAIR Additive Manufacturing Program, Tiers 1 & 2 was prepared and posted to the NAVAIR Aviation Technical Training (AVTECHTRA) NTSP website.

•Job aid production is saving direct maintenance man-hours and prototyping is setting quality standards for future prints. To date, 202 additively manufactured parts have been approved across the NAE; 25 of which were mission essential parts required to return an aircraft or system to mission capable status. 98% of approved parts beat OEM lead time resulting in a reduction of 2,368 days of average logistics delay time and a savings of approximately \$2 million over a fiscal year. By the end of FY22, MALS will have Tier 1 system sets delivered, and the Marine Corps overall will possess 26 Tier 1 systems, 13 Tier 2 systems, and 2 Tier 3 systems. Return on investment (ROI) data will only increase in the coming years as a mature process paves the path for speed and a vast library of approved Technical Data Packages at the ready to produce components with low to no lead time, low to no combat signature, and low to no operational lift requirement in support of future distributed operations.

Marine Aviation, in conjunction with industry, academia, and other uniformed partners, continue to seek technological advancements that will streamline maintenance procedures, enhance safety, and remove barriers that prevent our maintainers from efficiently working on aircraft.



MALS-31 designed, manufactured, and tested a fuel drain plug prototype for the F-35.



MARINE AVIATION SUSTAINMENT PLAN

AVLOG CONTINUUM OF EDUCATION

Properly trained maintainers and maintenance managers are the bedrock of a strong maintenance community. As stated in the Commandant's Planning Guidance, "everything starts and ends with the individual Marine." The training continuum starts with leaders, including 75XX squadron Commanding Officers and Aircraft Maintenance Officers (AMOs), and flows holistically through staff non-commissioned officers and junior officers to entry level technicians and young supervisors. Multiple technical and managerial training initiatives focused on post-accession maintenance personnel have been implemented. Aviation will continue to leverage MAWTS as a repository for Marine aviation fleet-wide maintenance best practices and MATSG-23 to shape formal school curricula.

ADVANCED AVIATION MAINTENANCE OFFICER COURSE (AAMOC)

AAMOC challenges seasoned maintenance officers by immersing them in a real-time, high operational tempo maintenance environment combined with a demanding academic schedule. This POI is a challenging seven-week graduate-level training evolution that is conducted in concert with the semi-annual MAWTS-1 WTI course. During this course, students will participate in more than 100 hours of classroom instruction, multiple practical applications, and an intensive instructorship development curriculum. The intent is to create 6077 WTI's with an advanced technical understanding and standardized maintenance practice. The goal of these instructors is to increase OJT effectiveness within each MAG to ultimately reduced maintenance-related mishaps and increased aircraft readiness. These instructors are the signature authority for the 6002/6004 T&R. Marines that do not meet the AAMOC pre-requisites are eligible to attend in an academic capacity for select classes only, although they will not earn the 6077 WTI MOS. As of 2021, AAMOC has graduated more than 120 WTI's over nine classes, several of whom now hold key billets in Aviation Maintenance.



MAWTS MAINTENANCE MANAGEMENT COURSE (3MC)

In addition to AAMOC, MAWTS-1 delivers the MAWTS Maintenance Management Course (3MC). This Period of Instruction (POI) is independent of WTI courses and targets 75XX community with an emphasis on those serving as Aircraft Maintenance Officers, Assistant Aircraft Maintenance Officers, Quality Assurance Officers, and Division Officers. 3MC also targets the Staff Non-Commissioned Officer's within the maintenance department, especially those in Maintenance Control, Quality Assurance, and Maintenance Chiefs. This week-long course covers a wide range of topics, similar to those taught during the AAMOC POI, all of which are tailored to the target audience with the intent of making them more effective maintenance managers. MAWTS-1 AAMOC staff host one resident 3MC class per year that runs concurrently with the Spring WTI class. This resident class specifically targets Expeditionary Warfare School Aviation Combat Element (ACE) Occupational Field Expansion Course (OFEC) students, but all aircrew and aviation logistics personnel are encouraged to attend. During the MAWTS Fleet Support periods, the AAMOC staff will travel to various units that request an onsite 3MC and utilizes local 6077's to augment the AAMOC instructors. As of 2021, 3MC trained 200 officers and staff non-commissioned officers over the course of ten resident and fleet support classes, and is working recognition for the curriculum through the Center of Naval Aviation Technical Training.

MARINE AVIATION SUSTAINMENT PLAN

AVIONICS OFFICER AND AVIONICS CHIEF COURSE

Recognizing the importance of providing relevant and timely training to newly promoted Avionics Officers (AVO) and Chiefs (AVC), development has begun in the establishment of a formal AVO MOS producing course. The first pilot course is planned for FY22, and addresses proficiency levels required by commands from those subject matter experts, including, but not limited to: aircraft survivability equipment, electronic countermeasures equipment, electronic keying material, laser system safety, digital interoperability, and 5th generation avionics systems. This course will better equip our AVO/AVCs to meet the demands of the complex technological and interoperable requirements of today's aircraft.

TRAINING AND READINESS (T&R)

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

regarding measurable capacity and the health and effectiveness of the squadron.



Aircraft touch-time is central to both building experience within the workforce and ensuring efficient application of available manpower. Much like pilots track and report flight hours per aircrew per month, Marine Corps aviation is tracking Key Performance Indicators (KPI) that measure aircraft touch-time in an actionable way that will feed iterative development of further KPI. Touch-time KPI include Direct Maintenance Man-Hours per Worker per Day, Workers Performing Maintenance per Day, and Direct Maintenance Man-Hours per Flight Hour per Work Center.

MARINE AVIATION SUSTAINMENT PLAN

AVIATION SUPPLY

BEYOND REGIONAL SUPPLY CHAIN MODERNIZATION

As the aviation supply community successfully transitioned through retail supply chain modernization, the restructured Aviation Supply Department and Wing Allowancing Section serve as the starting point for a longer term, sustained plan to pursue even greater material readiness improvements. Central to this outlook is the Aviation Supply Campaign Plan spanning several focus areas aligned to Deputy Commandant for Aviation essential tasks: assessing readiness (Non-Mission Capable Supply degradation, internal / external task organization); developing policy and practices (retail allowancing policy); training requirements (Supply Managers Course, F-35 specific, integration into Automated Skills Management); warfare concepts and doctrine (disaggregated Amphibious Ready Group, Expeditionary Advanced Base Operations); and innovative technologies or systems (scanning services, Naval Operational Supply Support).

Various Operational Planning Teams comprised of Fleet and supporting establishment stakeholders are working through the associated problem sets and opportunities, tackling the analysis and formulating recommendations in a decentralized fashion that leverages expertise, talent, and multiple supply support perspectives. For instance, the disaggregated operation of MEU ACE aircraft aboard a non-NTCSS capable or AIMD supported ship presents a problem for basic material replenishment. Current experimentation with deployed Unit Identification Codes within the business systems and logic used to process material orders is yielding favorable results for possible use during future deployments.

FIRST LINE OF MATERIAL DEFENSE

Retail level inventories serve as the first line of defense in mitigating the impact of Non-Mission Capable Supply (NMCS) scenarios encountered as organizational and intermediate maintenance activities work to sustain aircraft. Customer Optimized Leveling Technique / Predictive Demand Leveling (COLT/PDL) - a concerted effort to reduce Customer Wait Time and expand stocking levels for readiness impacting material - was undertaken with positive results across both Fixed and Rotary Wing supporting MALS. While effective as originally devised, the opportunity and imperative exist to retool the business rules associated with consumable item allowancing to make the inventory more efficient - a fresh look at improving the "never out" versus risk trade-offs in anticipation of more distributed, smaller scale footprints supporting the future force. Cost thresholds and incorporation of Fleet demand profiles are areas that can be refined to still generate readiness outcomes without jeopardizing consumable material support to an aircraft platform or task organized aviation unit.

Data analytics is increasingly foundational to ensuring our material support posture is firmly rooted in defensible and rigorous methods for determining requirements, identifying root causes, and enhancing readiness. The long-standing use of increased aircraft utilization rates for wartime material support (i.e. range and depth) planning is overdue for re-imagining the way an allowance package will be taxed by increased operational tempo. In partnership with the Office of the Chief of Naval Operations (OPNAV), Naval Supply Systems Command (NAVSUP), NAVAIR, and the Institute for Defense Analyses (IDA), Fiscal Year 2022 will explore the use of robust simulation techniques to exercise baseline supply and demand profiles in the context of a wartime scenario.

Additionally, Commander Fleet Readiness Center's Fleet Support Team (FST) Headquarters supply data analytics effort is working laterally across all NAVAIR Program Management Offices to identify specific issues impacting supply chain health - an endeavor that will benefit from sustained interaction with Marine aviation supply personnel.

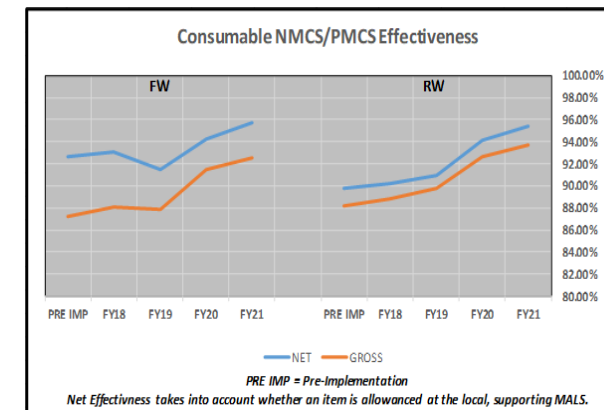
MARINE AVIATION SUSTAINMENT PLAN

AVIATION SUPPLY AND THE FUTURE FORCE

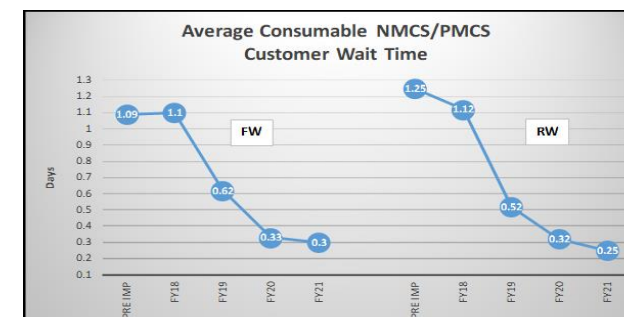
The execution of aviation supply functions in support of the future force (2030) will require proficient Marines capable of operating modernized or specialized aviation supply information technology systems in support of fifth / next generation platforms with evolving maintenance philosophies placing an increased emphasis on spare parts. To that end, efforts in improved training and efficient use of manpower across the 6602, 6604, and 6672 PMOS occupational fields will position the aviation supply community to remain resilient, relevant, and impactful in supporting the ACE.

The revised Aviation Supply Managers Course serves as the most comprehensive, post-accession training opportunity to build tactical level aviation supply expertise - especially as Marines rotate back from Special Duty Assignment tours or time away from the Supply Department. Fiscal Year 2022 will also see the culmination and formal, Training and Education Command sponsored adoption of aviation supply Training and Readiness standards. The expansion of Marines at both principal wholesale activities supporting naval aviation (NAVSUP - Weapon Systems Support Philadelphia and Defense Logistics Agency - Aviation Richmond), will enable advocacy of Type / Model / Series specific concerns and infuse wholesale experience back into the operational ranks. Additionally, broader initiatives like Naval Sustainment System - Supply are transforming the way end to end supply chain management is integrated and coordinated, with targeted and cost-conscious improvements in demand predictability, Working Capital Fund cash management, and the industrial base (suppliers, organic repair capacity, and repair turnaround times).

As the Marine Aviation Logistics Support Program (MALSP) Modernization effort undergoes its next evolutionary iteration - potentially envisioning different methods of support package employment - there will be a deliberate tie into the broader MAGTF logistics support construct (i.e. distribution networks) as well as the conduct of essential repair / re-supply functions supporting Distributed Maritime Operations. Engagement in naval or joint supply support initiatives and developments becomes essential to registering Marine aviation needs, preserving expeditionary capability, and leveraging validated solutions.



Making aviation stores more efficient while maintaining supply support improvements



MARINE AVIATION SUSTAINMENT PLAN

AVIATION LOGISTICS INFORMATION MANAGEMENT SYSTEMS (ALIMS)

AVIATION INFORMATION SYSTEMS INITIATIVES

The battlespace of the future will require operating in distributed environments, which is driving the need to integrate more powerful, more capable, and more agile systems, capable of sustaining expeditionary capabilities while transitioning from shore to afloat environments, and rapidly transition to forward operating locations. In order to facilitate this change, Aviation Information Systems (AIS) are redefining operational capabilities capable of supporting distributed operations by investing in information technology (IT), essential training, policy, and operational sustainment plans that will enhance Marine Aviation capabilities to compete, deter, and win! AIS future programs will be enhanced by improving operational availability, reliability, and sustainability across the naval logistic support enterprise to meet future IT challenges. ASB has strategically placed SMEs in key positions to work with resource sponsors and partners on the sustainment strategy to consolidate systems, lessen equipment footprint, and move Aviation IT toward a newer generation of deployable hardened systems to support Aviation warfighting requirements.

ASB continues to collaborate with the U.S. Navy to drive a digital transformation of legacy maintenance systems with a fully modernized, responsive logistics information system solution called Naval Operational Business Logistics Enterprise (NOBLE) family of systems (FoS), which is a strategic move to the next generation of logistic systems. The NOBLE FoS is comprised of the Naval Operational Supply System (NOSS) for supply chain and

financial management, the Navy Maintenance Repair and Overhaul (N-MRO) for aviation maintenance and component life tracking (replacement of the current OOMA/NALCOMIS), and an Integrated Data Environment (IDE) to serve as a data repository. The Marine Corps will operate the NOBLE FoS within a scalable and fully deployable Hybrid Cloud environment designed to simplify and upgrade the current user interface and facilitate a higher degree of supply and maintenance documentation fidelity and analysis to inform better decisions from tactical to strategic level decision makers.

In FY-23, limited deployment of N-MRO will be implemented and tested for a period of six-months. During this time, developers will continue to build the full deployment for implementation to the fleet during the remainder of the next three to five years.

MARINE AVIATION SUSTAINMENT PLAN

AVIATION LOGISTICS INFORMATION MANAGEMENT SYSTEMS (ALIMS)

AVIATION INFORMATION SYSTEMS INITIATIVES

In response to input from Marine Aviation and program partners, the Joint Program Office for F-35 is working to provide a modern and affordable logistics information system that is a high quality, user-centric system, capable of leveraging modern architectures and technologies that increases maintenance efficiency, decreases aircraft turnaround time, and rapidly responds to changing warfighter requirements. The Operational Data Integrated Network (ODIN) infrastructure strategic objectives will reduce sustainment costs, deploy secure, easy to use, and intuitive systems that will enhance operational effectiveness. This will be made possible by leveraging industry standards and open systems enabling rapid updates and future competition. These initiatives will optimize alignment with services logistics IT roadmaps, and foster an agile and adaptive environment for transformational learning and growth. The ODIN development efforts will resolve life cycle obsolescence issues, and constraints introduced by legacy architecture limitations in performance, size/weight. These initiatives will enhance Aviation Information Systems by introducing more scalable and adaptive technologies, capable of integrating with ACE Command and Control (C2) systems to support maneuver warfare tactics, techniques, and procedures to fully exploit operational concepts. These systems drive sustained operational capability in all range of military operations, to include contested Degrade, Disconnected, Intermittent, or Limited (DDIL) environments.

TRAINING

Advances in Information technologies and newly fielded Aviation Information System forced ALIMS community to constantly adapt and train our Marines to meet the required skillsets. As a community wide effort and in coordination with TECOM and the Formal Learning Center, development has begun on curriculum to establish the formal ALIMS Senior Leader Course. The target audience will be SNCOs and is projected for implementation in 2022.



MARINE AVIATION SUSTAINMENT PLAN

AVIONICS

AIRCRAFT WIRING SYSTEMS INITIATIVE

NAVAIR wiring evaluations have identified numerous critical defects on what were believed to be full mission capable aircraft across all wings and T/M/S. Rectifying steps, such as the Advanced Wire Repair Course, are underway to correct deficiencies and train fleet personnel on proper procedures. The importance of identifying wiring as a system cannot be overstated. Only through continued education and adherence to standards will the material condition of aircraft wiring be improved. In order to establish a healthy and effective maintenance base and to maintain gains we have realized through various initiatives such as CH-53 reset and advanced wire training, an initiative was developed to incorporate wire test and inspection procedures into legacy aircraft PMI events. Procedures are being developed to incorporate Electrical Wiring Interconnect System (EWIS) processes into significantly degraded legacy system. The result of a focused team conducting EWIS maintenance during a PMI event is an aircraft delivered to the fleet with critical wiring defects identified and corrected.

FUTURE AUTOMATIC TEST EQUIPMENT SUPPORT

The Marine Corps currently utilizes the Reconfigurable Transportable Consolidated Automated

Support System (RTCASS) to diagnose and repair aircraft avionics components. The Navy is currently in the process of transitioning their Automatic Test Equipment to the electronic CASS (eCASS) family of test systems at their shore sites and aboard CVN/L-Class ships. ASB, in conjunction with PMA-260, identified a requirement to replace all legacy RTCASS with eCASS beginning in FY23. This DoN solution aligns USMC and Navy ATE solutions providing reduced operating and sustainment costs throughout the life cycle of the program. While currently unfunded, this solution will provide an eCASS system to meet the requirement at all rotary and tilt-rotor MALS. In order to support the emerging F-35 intermediate level maintenance requirement, the Marine Corps is scheduled to receive eCASS benches beginning in FY22. The eCASS solution will be distributed among all fixed wing MALS sites to support the enhanced intermediate level maintenance requirements being planned for the F-35.



MARINE AVIATION SUSTAINMENT PLAN

AVIATION ORDNANCE

The Marine Corps Aviation Ordnance Enterprise continues to refine and progress its operational tactics, techniques, and procedures to support Force Design 2030 experimentation and concept development while maintaining robust capability to execute the full spectrum of ordnance operations in support of the MAGTF. Future operational necessities, coupled with the fielding of newly developed air launched weapons with greater range and sophistication, requires refinement of current ordnance handling, loading and transportation techniques, and development of new techniques and equipment in order to support Distributed Aviation Operations (DAO) and expeditionary advanced basing concepts. We must account for the prospect of contested lines of communication and supply of critical munitions to support Forward Arming and Refueling Point (FARP) operations will also require departure from current-day munitions positioning practices and demand a far more agile and responsive supply chain, able to reliably source and transport key munitions to the right location at the right time to support dynamic operational requirements. These challenges will be confronted through three lines of effort: 1) Enhanced use of Organizational and Intermediate Level Military Occupational Specialties (MOS) through teaming, 2) Materiel resource management and expeditionary enabler development and, 3) Use of formal education and the leveraging of training opportunities which build a broader experience base and enhance the capabilities of the individual Aviation Ordnance Marine.

MOS OPTIMIZATION AND TEAMING

As force design concepts emerge from war gaming, large force exercises and experimentation across the Fleet

Marine Force (FMF), it has become evident that conducting DAO demands more capable Aviation Ordnance Marines that are able to carry out



Organizational (O) and Intermediate (I) Level Ordnance Operations at multiple locations, on multiple Type Model Series (T/M/S) aircraft, simultaneously. This can be effectively achieved by teaming of O- and I- Level Marines trained and able to carry out ordnance handling, storage, transportation, aircraft loading and arming operations. It is further recognized that the future operational environment will require Ordnance Marines to possess the capability to perform these tasks on joint service and partner nation aircraft as well. Initial steps in this direction have been to utilize O and I Level cross training opportunities and changes to the MCO 8023 to enable certification/qualification of USMC Armament Teams to conduct ordnance operations on multiple USMC T/M/S, joint service and partner nation aircraft as operationally required by commanders.

MARINE AVIATION SUSTAINMENT PLAN

AVIATION ORDNANCE

MATERIEL RESOURCE MANAGEMENT AND EXPEDITIONARY ENABLER DEVELOPMENT

The Marine Aviation Logistics Squadron is currently postured for ordnance operations in an expeditionary environment. The Marine Corps has fielded a variety of Armament Weapons Support Equipment (AWSE) designed for large scale aviation operations. This current AWSE posture, although a key enabler for large scale protracted aviation operations, is largely unsuitable for distributed operations. To address this, Marine Aviation will conduct a bottom-up review of the current AWSE posture across the FMF to challenge current allowancing, and range and depth of existing equipment. This review will inform right-sizing decisions, divesture opportunities and identify shortfalls in asset capability for use in DAO. The size and weight of current- day AWSE and associated prime movers preclude L-Class embarkation, transportation from ship to shore for use in FARP environs and requires a large air and sealift transportation footprint that severely hinders operational agility. We must seek out and procure low cost, simplistic, corrosion resilient AWSE and expeditionary enablers that can be positioned for long periods without need for preventative maintenance, corrosion treatments, repair or upkeep. We must aggressively pursue AWSE for use in DAO environs that are “consumable enablers”. Thus able to be proliferated across wide operational areas and can remain



for long periods without the substantial maintenance and upkeep requirements of current-day equipment. The use by commercial industry of load bearing plastics with stiffeners could be ideally adapted for such purposes.

There is a clear demand for development of a Multi-Use Loader, Expeditionary (MULE) that can perform multiple tasks such as moving and positioning munitions within a DAO environment to and from storage/staging locations, break out and assembly functions as well as loading of fixed and rotary wing weapon stations. Much like AWSE, our current day munitions loader, was not designed and fielded for use in support of DAO and its size precludes L-Class embarkation and transportation from ship to shore. In addition, it cannot be used on rough terrain or on unimproved surfaces. These limiting factors represent a capability gap highlighted very clearly by Force Design 2030 which demands development and fielding of MULE capability in support of DAO and MAGTF operations.

MARINE AVIATION SUSTAINMENT PLAN

AVIATION ORDNANCE

ENHANCED FORMAL EDUCATION AND TRAINING

HQMC Aviation recognizes the need to expand professional MOS education for Marines transferring between and among different T/M/S platforms. As the Marine Corps TACAIR transition continues, this will enable stand up of T/M/S specific training for O level Ordnance Personnel at an F-35/H-1 FRD/FRS. Once complete, this will provide technical training beyond the current model of initial accession training only, and on the job training for career Marines that transfer to a different T/M/S during follow on assignments. Professionalization of the Aviation Ordnance MOS through the MAWTS-1 Expeditionary Ordnance Course (MEOC) will continue. MEOC graduates now receive the Necessary MOS (NMOS) of 6577, Aviation Ordnance Weapons and Tactics Instructor, which enables better identification for future assignment. Planned assignment of Top Secret/Sensitive Compartmented Information (TS/SCI) Security Clearance for those granted the 6577 NMOS will

enable informed planning and access to the right expertise at various levels of the MAGTF. We will also continue to provide realistic cross-training opportunities for O and I-level Aviation Ordnance occupational specialties, with the goal of leveraging the additional skills and knowledge gained into force multipliers during DAO.

The Aviation Ordnance Enterprise must be prepared to perform across the full spectrum of aviation operations, from conducting large scale consolidated operations, to those in support of a composite Marine Expeditionary Unit Aviation Combat Element, through Expeditionary Advanced Base and Distributed Operations. In support of Force Design, we will continue to provide aviation ordnance subject matter expertise to the ongoing war gaming and operational planning forums to inform requirements and capabilities to facilitate experimentation. We must also continue to strengthen our technical skills, developing and refining our tactics, techniques and procedures to meet future challenges and demands. These lines of effort will address current capability gaps and provide materiel solutions to address current shortfalls and to overcome aviation sustainment challenges of the future.



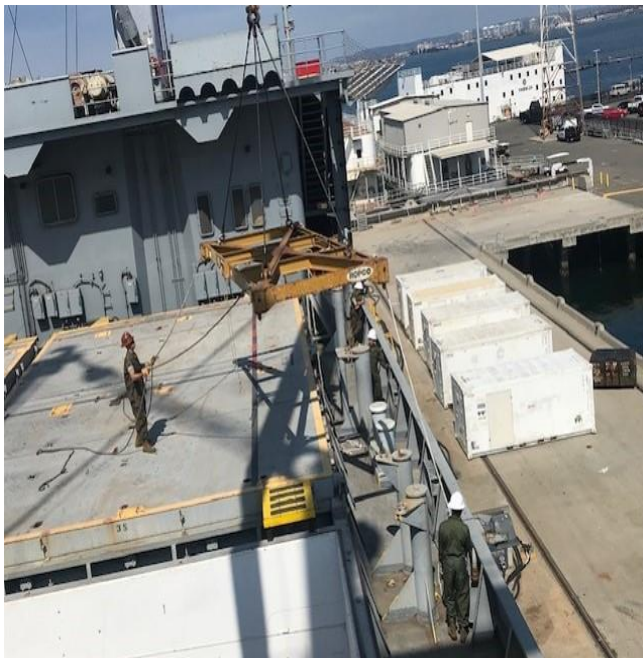
Ordnance Marines aboard HMS *Queen Elizabeth*.

MARINE AVIATION SUSTAINMENT PLAN

OPLAN SUPPORT AND MAGTF LOGISTICS INTEGRATION

T-AVB

Marine aviation employs two dedicated aviation logistics support ships (T-AVB). The ships provide 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, rotary, and tilt-rotor aircraft operations. The T-AVB flight deck is certified for all Marine rotary and tilt-rotor aircraft in the inventory. T-AVBs can operate in three modes; operational, transport, or combination. The flexibility provided by this afloat logistics platform replaces the need for approximately 75 C-17s to lift an equivalent force to an area of operation.



MAGTF LOGISTICS

The T-AVB continues to integrate into exercises representing present day and future engagements. The ship provides the commander an additional platform capable of supporting Expeditionary Advanced Basing Operations from a small agile alternative. T-AVBs, in conjunction with the Warfighting Laboratory, have participated in various unmanned initiatives providing an organic capability supporting various intelligence/surveillance/reconnaissance roles as well providing air/surface connector for afloat logistics requirements.

The T-AVB, when integrated into a larger naval force, provides the MAGTF with a versatile afloat aviation logistics capability, enabling intermediate-level maintenance closer to the fight. The unique aspect of these vessels has supported operations in multiple roles for joint exercises and operational planning. Continued efforts to modernize the vessels and shape their replacements will redefine how we support the fight in future operating environments.

Marine Aviation Platforms and Programs

- 3.1 Active-Duty Marine Aircraft Wing Organization, Fixed-Wing, Tiltrotor, Rotary-Wing, Electronic Warfare, Future Vertical Lift, Unmanned Aircraft, Adversary, OSA, HMX
- 3.2 Weapons and Munitions Plan
- 3.3 Digital Interoperability
- 3.4 Aircraft Survivability Equipment

SECTION 3

MARINE AVIATION AIRCRAFT INVENTORY

PAA (PRIMARY AIRCRAFT AUTHORIZED)

T/M/S	PMAA PRIMARY MISSION	PTAA FRS/ TNG	PDAA RDT&E	POAA OTHER/ SPECIAL MISSION	BAA BACKUP	AA FACTOR
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Defined by

- CJCSINST 4410.01G Standardized Terminology for Aircraft Inventory Management
- SECNAV 5442.3 Management of the Naval Aircraft Inventory and Unmanned Aircraft Systems

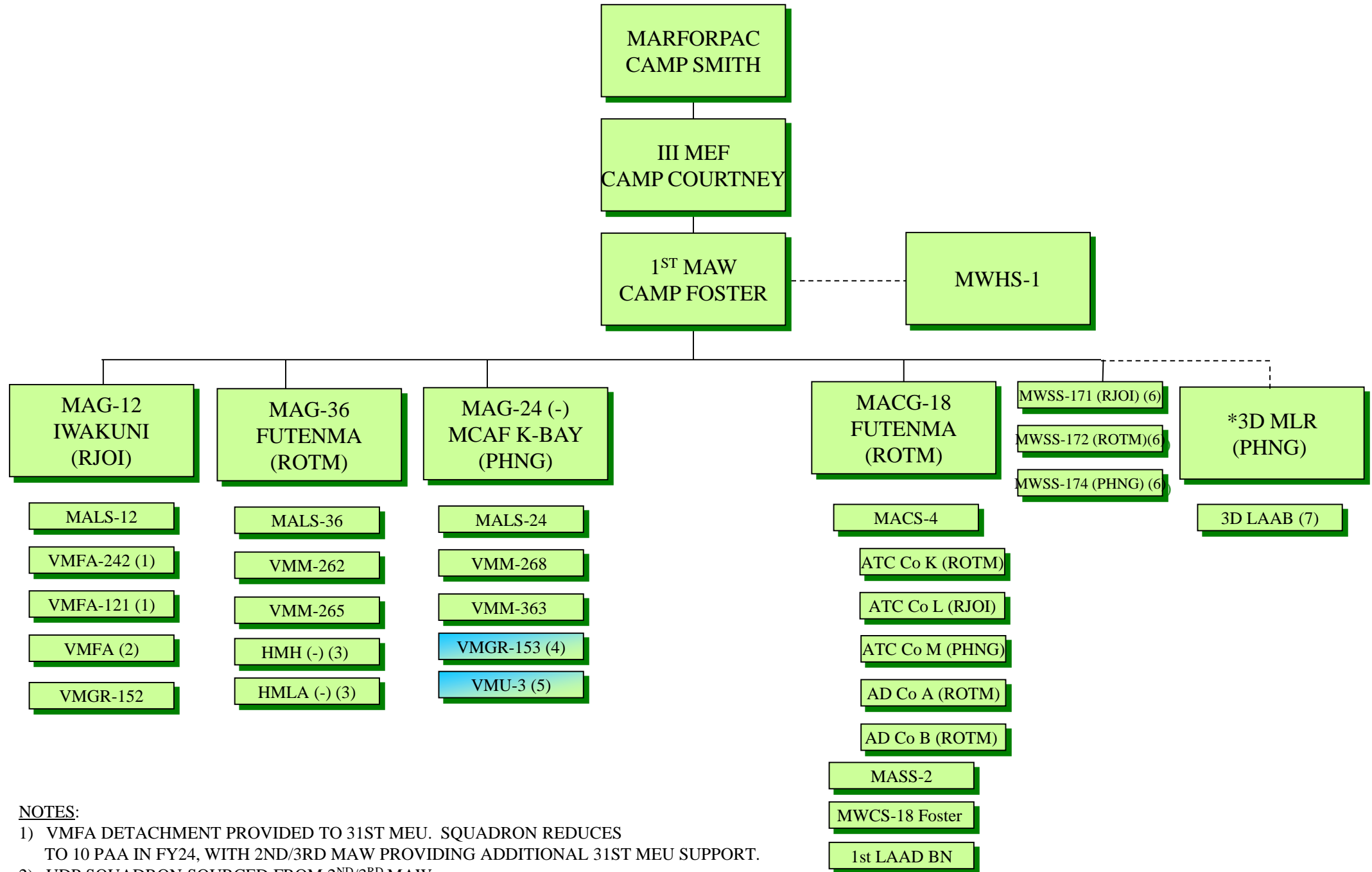
PMAA(Primary Mission Aircraft Authorization)- Aircraft authorized to a unit for performance of its mission

6-Apr-22

	PAA (PRIMARY AIRCRAFT AUTHORIZED)											TOTAL REQ'D	CURRENT INVENTORY	△	DEPOT
	T/M/S	AVG AGE OF FLEET	PMAA PRIMARY MISSION	PTAA FRS/ TNG	PDAA RDT&E	POAA OTHER/ SPECIAL MISSION	PAA	BAA FACTOR % OF PAA	BAA BACKUP	AA FACTOR	AA FY 22				
T A C T I C A L	AH-1Z	4	130	15	3	0	148	6.8	10	0.2	0	158	159	1	0
	UH-1Y	8	104	12	3	0	119	5.5	6	0.0	0	125	128	3	3
	MV-22B	9	198	27	17	0	242	22.6	54	0.4	1	297	296	(1)	35
	CH-53E	33	103	21	0	0	124	24.9	30	1.5	2	156	137	(19)	20
	CH-53K	1	6	0	2	0	8	16.7	1	1.0	0	9	6	(3)	0
	AV-8B	23	52	0	0	0	52	11.1	5	1.2	1	58	53	(5)	0
	FA-18A	35	0	0	0	0	0	10.0	0	2.5	0	0	1	1	0
	FA-18C	27	63	17	0	0	80	41.2	32	1.3	1	113	139	26	21
	FA-18D	27	29	18	0	0	47	39.1	18	0.5	0	65	80	15	19
	F-35B	4	67	41	6	0	114	7.6	8	0.7	1	123	116	(7)	8
	F-35C	1	10	0	0	0	10	9.3	0	0.0	0	10	10	0	0
	KC-130J	12	57	0	0	0	57	29.3	16	0.5	0	73	63	(10)	9
	MQ-9A	0	2	0	0	0	2	0.0	0	0.0	0	2	2	0	0
	RQ-21	4	11	0	0	0	11	0.0	0	0.0	0	11	0	(11)	0
TOTALS		832	151	31	0	1014	17.8%	180		6	1200	1190	(10)	115	
O T H E R	TAV-8B	32	0	6	0	0	6	11.1	0	0.0	0	6	6	0	0
	F-5F	43	0	1	0	0	1	33.3	0	0.0	0	1	1	0	0
	F-5N	40	0	11	0	0	11	30.0	3	0.6	0	14	11	(3)	4
	C-20	27	2	0	0	0	2	25.0	0	0.0	0	2	2	0	0
	UC-12	35/33/9	15	0	0	0	15	0.0	0	0.0	0	15	12	(3)	0
	UC-35	17	10	0	0	0	10	0.0	0	0.0	0	10	10	0	1
	T-34	43	0	3	0	0	3	12.5	0	0.0	0	3	3	0	1
	UH-3D	53	0	0	0	0	0	0.0	0	0.0	0	0	1	1	N/A
	VH-3D	46	9	0	0	0	9	0.0	0	0.0	0	9	11	2	N/A
	UH-60N	21	0	1	0	0	1	0.0	0	0.0	0	1	1	0	N/A
	VH-60N	33	6	0	0	0	6	0.0	0	0.0	0	6	8	2	N/A
VH-92A	1	11	0	0	0	11	10.0	1	0.0	0	12	6	(6)	N/A	
TOTALS		53	22	0	0	75	4.0%	3		0	78	72	(6)	6	
GRAND TOTALS		885	173	31	0	1089	16.8%	183		6	1278	1262	(16)	121	

- DATA OBTAINED FROM AVIATION CURRENT REQUIREMENT NUMBERS
- DATA OBTAINED FROM TMS APDF Ver 135 BES 23 10 NOV 2021
- CALCULATED NUMBERS
- DATA FROM AMSRR/AIRRS

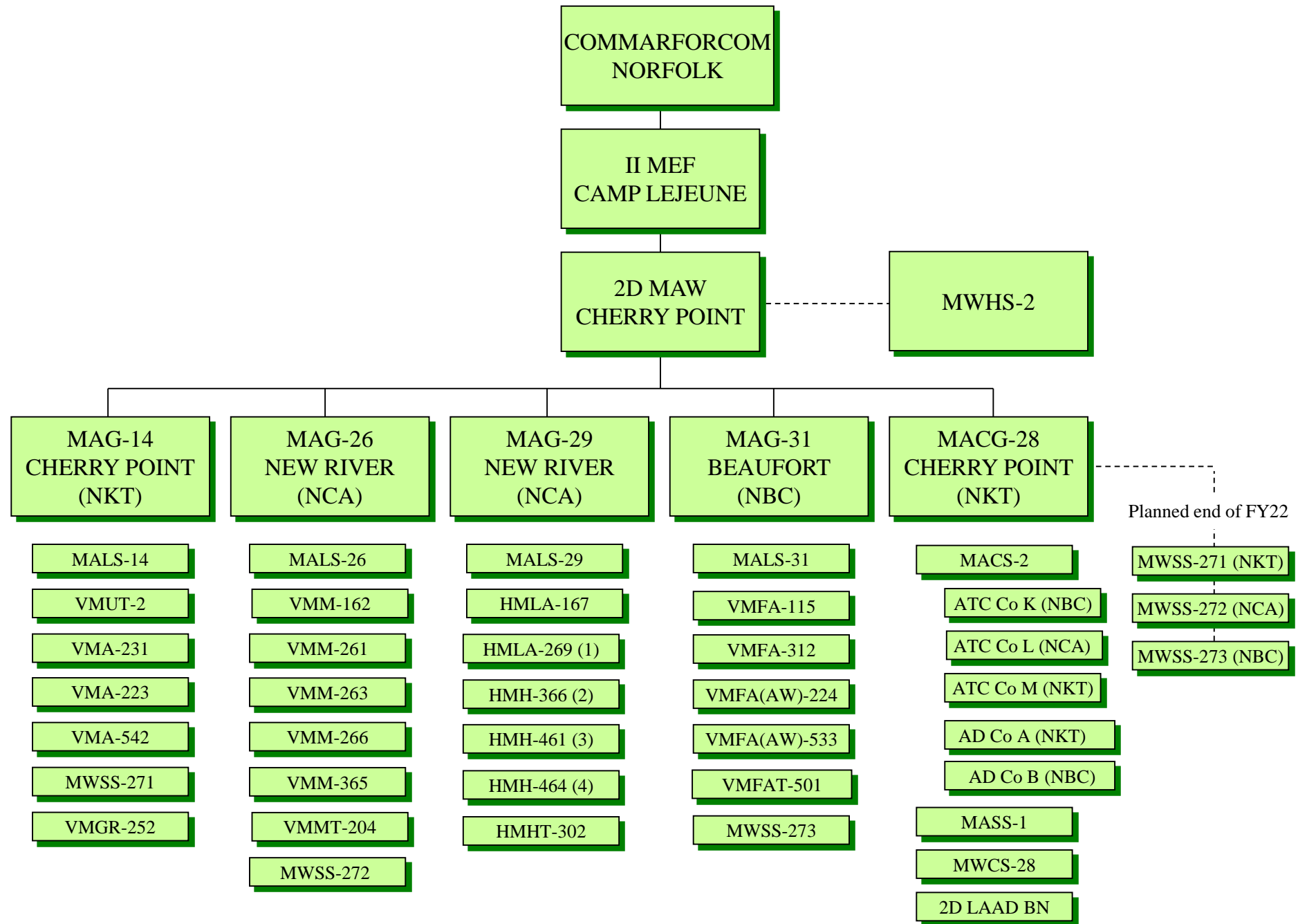
MARFORPAC/1ST MAW ORGANIZATIONAL CHART



NOTES:

- 1) VMFA DETACHMENT PROVIDED TO 31ST MEU. SQUADRON REDUCES TO 10 PAA IN FY24, WITH 2ND/3RD MAW PROVIDING ADDITIONAL 31ST MEU SUPPORT.
- 2) UDP SQUADRON SOURCED FROM 2ND/3RD MAW.
- 3) UDP AND 31ST MEU SQUADRON (-) SOURCED FROM 3RD MAW.
- 4) VMGR-153 PLANNED IOC IN FY23 AND FOC IN FY26.
- 5) VMU-3 WILL TRANSITION FROM RQ-21 TO MQ-9B IN FY23.
- 6) MWSS FALL RESPECTIVE STATION/BASE WHICH FALLS UNDER THE MAW.
- 7) 3D LAAB MAPPED TO 3D MLR VIA MACG-18 STRUCTURE.

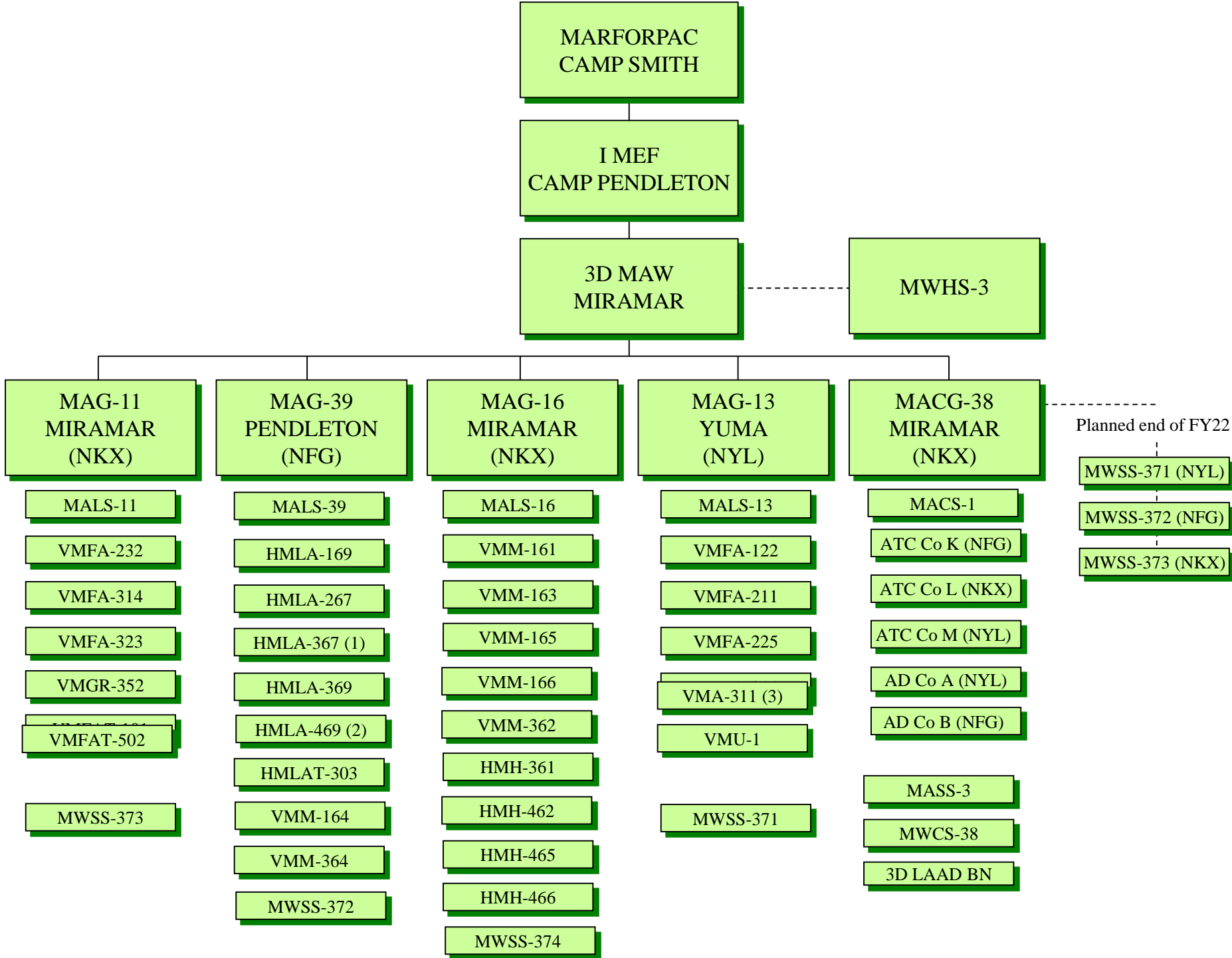
MARFORCOM/2ND MAW ORGANIZATIONAL CHART



NOTES:

- 1) HMLA-269 DEACTIVATES IN FY23.
- 2) HMH-366 DEACTIVATES IN FY23.
- 3) HMH-461 TRANSITIONED TO A CH-53K SQUADRON IN FY22.
- 4) HMH-464 DEACTIVATES IN FY24.

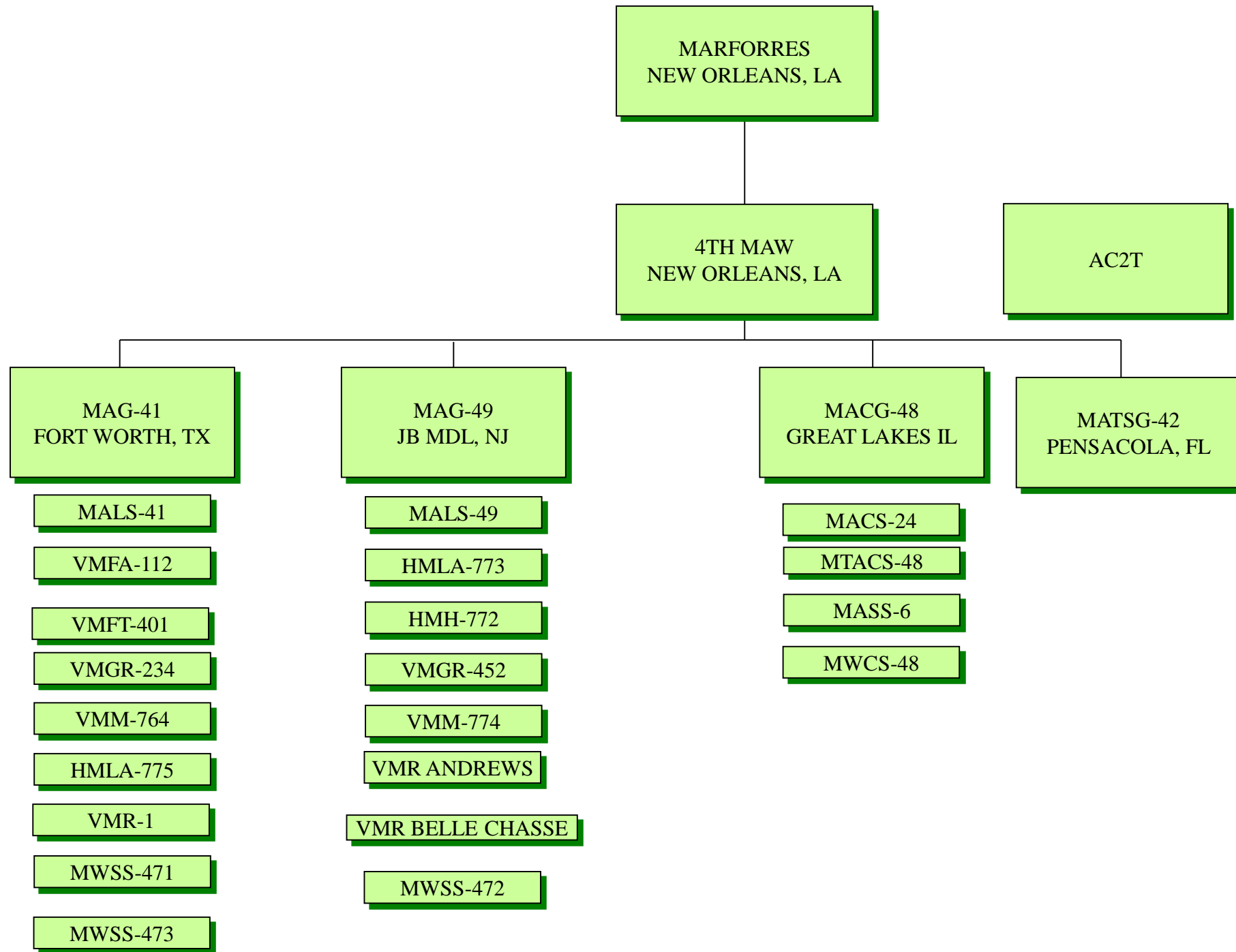
MARFORPAC/3RD MAW ORGANIZATIONAL CHART



NOTES:

- 1) HMLA-367 DEACTIVATES FROM MCB KANEOHE BAY FY22 AND REACTIVATES AT MCP CAMP PENDLETON IN FY23.
- 2) HMLA-469 DEACTIVATES FROM MCB CAMP PENDLETON IN FY23.
- 3) VMA-311 CADRED IN FY20, AND REACTIVATES IN FY24 AS AN F-35C SQUADRON IN MCAS MIRAMAR.

MARFORRES/4TH MAW ORGANIZATIONAL CHART




TACAIR TRANSITION PLAN

	FY14	FY15	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34	
VMX-1					Edwards	→ 6B	Yuma															
VMFAT-501	→ 25B		Beaufort																			
VMFA-121	6B → 16B		Japan								→ 10B											
VMFA-211			6B → 16B		Yuma			→ 10B														
VMFA-122						6B → 16B		→ 10B	Yuma													
VMFA-314								6C → 10C	Miramar													
VMFAT-502								6B → 16B		→ 25B	Beaufort -- Miramar (Dec '21)											
VMFA-242								6B → 16B	Japan	→ 10B												
VMFA-225								6B → 10B	Yuma													
VMFA-214								Yuma		6B → 10B			Yuma									
VMA-542								Cherry Point			6B → 10B		Cherry Point									
VMA-311							Yuma				6C → 10C		Miramar									
VMFA-533									Beaufort		6B → 10B		Beaufort									
VMFA-251						Beaufort					6C → 10C		Cherry Point									
VMFA-224									Beaufort			6B → 10B		Beaufort								
VMA-231										Cherry Point		6B → 10B		Cherry Point								
VMFA-115									Beaufort				6C → 10C		Cherry Point							
VMA-223									FY22: AV-8B FRD			Cherry Point		6B → 10B		Cherry Point						
VMFA-312												Beaufort		6B → 10B		Cherry Point						
VMFA-232													Miramar		6B → 10B		Miramar					
VMFA-323											FY24: F/A-18 FRD		Miramar		6B → 10B		Miramar					
VMFA-112 (RES)															Ft Worth		6B → 10B		Beaufort			
VMFA-134 (RES)																	6B → 10B		Miramar			

Note 1: Above Transition Plan reflects a transition to the F-35 Objective Force, as stated in Force Design 2030.

Note 2: Not all F-35 aircraft requirements are depicted (e.g., F-35C FRS detachments, DT detachment, pipeline and attrition aircraft, etc.). Sundown of VMFAT-101 in FY24 not depicted.

 Left side signifies redesignation of squadron and transition of structure from legacy platform to F-35; legacy flight ops cease during this period based on operational requirements

F-35B 16PAA
F-35B 10PAA
F-35C 10PAA
FRS 25PAA
 Left side aligns with squadron Safe-For-Flight; right side aligns with squadron Full Operational Capability

F-35 LIGHTNING II (VMFA) PLAN

VALUE TO THE MAGTF

The F-35 provides the MAGTF with operational flexibility, a survivable contributor to the overall sensor network, and unmatched lethality and tactical supremacy.

Flexible. The F-35 is the only 5th generation platform designed to operate from both the ship and the shore, onboard the LHA/LHD and CVN as well as from expeditionary and prepared landing fields. The F-35 provides options and agility to the MAGTF commander, and a planning challenge to the threat.

Survivable. Advanced stealth characteristics enable the F-35 to survive and persist inside the WEZ of a threat, uniquely contributing to the MAGTF's over-the-horizon reconnaissance effort not only in competition, but in conflict as well.

Sensors. State of the art sensors and networks allow the F-35 to sense-and-make-sense of the battlespace, autonomously providing robust data to MAGTF C2 agencies and enabling intelligence collection and targeting across the joint force. The F-35 supports the force by detecting, identifying, and maintaining custody of key targets, and holding those targets at risk.

Lethal. Designed to operate in a contested environment against a peer threat, the F-35 is capable of completing the entirety of a kill chain with onboard systems and weaponry, should the broader joint sensor network and kill web be compromised. Offensively, the F-35 provides the MAGTF a dynamic, long-range striking capability against a broad range targets; moving or fixed, on land or at sea, day or night, in all weather conditions. Defensively, the F-35 supports the MLR by serving as the outer ring of protection in a layered defense network, fully integrated into the overall Marine

air defense effort. In a permissive environment, the F-35 can be configured to support the GCE as a highly-capable close air support platform, exceeding the payload and on-station time of legacy aircraft.

The F-35B is the Short Takeoff and Vertical Landing (STOVL) variant, providing expeditionary flexibility to the MAGTF. It is designed to operate from the LHA/LHD as well as expeditionary airstrips less than 2,000' long. The flexibility incorporated into the F-35B results in a necessary reduction to internal fuel capacity and smaller internal weapon bays, as compared to the F-35C.

The complementary F-35C is designed to operate from conventional aircraft carriers or land bases, and provides operational maneuverability and persistence to the MAGTF. Superior internal fuel capacity results in a significantly increased combat radius and longer on-station times as compared to the F-35B. Larger internal weapon bays enable a wider variety of weapons carriage and employment options for the MAGTF to use to its advantage.

The US Marine Corps is procuring 353 F-35B and 67 F-35C, a total of 420 aircraft at the rate of roughly 20 aircraft per year. These aircraft are replacing our aging AV-8B and F/A-18 aircraft and have fully replaced the EA-6B electronic warfare workhorse. After completing the F-35 transition, 18 active-component operational squadrons will enable Marine Corps TACAIR to meet steady-state Global Force Management requirements.

MISSION STATEMENT

The F-35's mission is to locate, attack, and destroy surface targets, intercept and destroy enemy aircraft, and provide electronic warfare support.

F-35 LIGHTNING II (VMFA) PLAN

CAPABILITIES

Aircraft Specifications

- Empty Weight: 32,300 lbs (F-35B); 34,800 lbs (F-35C)
- Internal Fuel: 13,500 lbs (F-35B); 19,750 lbs (F-35C)
- Payload: 15,000 lbs (F-35B); 18,000 lbs (F-35C)
- Max Gross: 60,000 lb class (F-35B); 70,000 lb class (F-35C)
- Top Speed: Mach 1.6 (~1,200 mph)

- Min Runway Length: 2,000' (F-35B); 6,000' (F-35C)
- Max Range: 900nm (F-35B); 1450nm (F-35C)
- Combat Radius: 400nm (F-35B); 675nm (F-35C)

NOTE: Contact HQMC Aviation for amplifying details regarding takeoff and/or flight profile parameters.

Systems

- Sensors (Fused)
 - APG-81 AESA Radar (to include SAR, GMTT, ATRBC)
 - Advanced Electronic Warfare Geo-Location Suite
 - Infrared Search and Track System (IRST)
 - 360° Infrared Distributed Aperture System (DAS)
 - Targeting FLIR with Laser Designator
- Communications/Datalinks
 - Multi-function Advanced Data Link (MADL); voice/data
 - Link-16; voice/data
 - Variable Message Format (VMF)
 - Interim Full-Motion Video (IFMV)
 - UHF and VHF (HQ II and SINCGARS capable)

Weapon Stations

- Internal
 - 2 x AIM-120 AMRAAM
 - F-35B 2 x 1,000 pound class (air-air or air-surface)
 - F-35C 2 x 2,000 pound class (air-air or air-surface)
- External
 - 2 x AIM-9X SIDEWINDER, 25mm Gun Pod
 - F-35B 2 x 1,000 pound class + 2 x 5,000 pound class
 - F-35C 2 x 2,000 pound class + 2 x 5,000 pound class

Authorized Ordnance

- AIM-120 AMRAAM
- AIM-9X Block 2 SIDEWINDER

- GPU-9/A 25mm Gun Pod
- GBU-12 Paveway II LGB (2x internal; 4x external)
- GBU-31 JDAM (2x internal; F-35C only)
- GBU-32 JDAM (2x internal; F-35B only)
- GBU-49 Enhanced Paveway II LGB (4x external; F-35B only)
- GBU-53 Small Diameter Bomb II (8x internal)
- AGM-154 Joint Standoff Weapon (2x internal; F-35C only)

Survivability

- Very Low Observable (VLO)
- Advanced Electronic Attack and Electronic Warfare Suite
- Advanced Electronic Protection
- Advanced IR and RF Countermeasures
- Threat missile launch reporting and tracking
- Auto Ground Collision Avoidance System (AGCAS)

Core Missions

- Suppression of Enemy Air Defenses
- Anti-Air Warfare (OAAW, AAD)
- Strike
- Strike Coordination and Reconnaissance
- Close Air Support

F-35 LIGHTNING II (VMFA) FUNDING PRIORITIES

1. Site Activations (Support Equipment, Simulators, Contract Support) – basing and capacity to enable transition timelines and Force Design capabilities
2. Block 4 Capabilities and Modifications – advanced capabilities including Electronic Warfare, targeting, and battlespace awareness for the MLR
3. Weapons Integration – Maritime Strike and networked weapons within Force Design



U.S. Marine Corps F-35 Lightning II aircraft assigned to Marine Fighter Attack Squadron 121 (VMFA-121) are positioned on the flight deck of the amphibious assault ship USS *Wasp* (LHD-1).

F-35 LIGHTNING II (VMFA) PLAN

ORGANIZATION

By the end of CY22, 142 F-35B and 22 F-35C will have been delivered to the Marine Corps. Those aircraft are supporting Developmental/Operational Test, an F-35B Fleet Replacement Squadron on each coast, an F-35C FRS detachment, as well as six established fleet squadrons.

With the exception of Iwakuni-based squadrons, all F-35 fleet squadrons are currently organized as 10 Primary Aircraft Assigned (PAA) squadrons, prepared to deploy as a squadron in support of the MEU or Carrier Air Wing (CVW). Iwakuni-based squadrons will re-organize as 10 PAA squadrons in FY24.

The F-35 now supports all 31st MEU and West Coast MEU deployments (previously supported by AV-8B), as well as the Tactical Aviation Integration (TAI) mission (previously supported by F/A-18). As the TACAIR transition continues, the F-35 will ultimately support all East Coast MEU and Unit

Deployment Program (UDP) obligations as well. Increased F-35 capabilities and associated MEU tasking necessitate an increased number of F-35s aboard the LHD/LHA, and those changes are incrementally being realized with each subsequent MEU deployment.

In Spring 2022, the F-35 will fulfill a DOT&E requirement to validate the ability to operate 20 F-35 aboard the *America*-class LHA.

TACTICAL AVIATION INTEGRATION (TAI)

The Marine Corps' commitment to naval integration and TAI persists through the TACAIR Transition to F-35. VMFA-314, the Marine Corps' first F-35C squadron, is currently deployed with the CVW as part of TAI. With the standup of a second F-35C squadron in FY24, the Marine Corps will have two F-35C squadrons dedicated to TAI.



F-35 LIGHTNING II (VMFA) PLAN

SUSTAINMENT

In the past several years, we have seen significant improvements in maintenance performance. The maintainer experience base has grown, which is driving increases in aircraft availability across the fleet. As the experience base continues to grow, we must capitalize on the many successes and lessons learned, and continue to train and qualify our maintainers to the highest standards.

The JSF Program Office (JPO) is led by the Program Executive Officer (PEO), and is comprised of five Program Management Offices (PMOs). All PMOs are responsible for lifecycle sustainment of their products.

The five JPO PMOs are:

- Air Vehicle
- Propulsion
- Combat Data Systems
- Training Systems and Simulations
- Maintenance Systems

The JPO Product Support Manager (PSM) develops sustainment strategies and oversees Hybrid Product Support Integrator (HPSI) execution of sustainment activities, including logistical site and ship activation, F-35 Air System readiness, and managing and supporting the Global Spares Pool (GSP). The F-35 Product Support Strategy is a Global Support Solution (GSS) used to sustain the F-35 for the services, international Partners, and FMS customers. The PSM has developed and is implementing a GSS sustainment strategy that leverages organic and commercial capabilities with the strategic objective to deliver life cycle sustainment that meets Warfighter requirements.

The F-35 current sustainment strategy is supported by Industry through a 3-year annualized sustainment contract. This contract covers on-site support of day-to-day operations from Lockheed Martin field service representatives, engineers, and Automatic Logistics Information System (ALIS) administrators, along with sustaining engineering, supply chain, repair and replenishment of material, and training.

This contract focuses on increasing F-35 Full Mission Capable (FMC) rates, improving supply availability, and improving on the delivery of Electronic Equipment Log (EEL) data through incentivized performance metrics. The incentive structure is to drive year over year improvements to affordability and performance targets. Lockheed Martin will not receive fees for stagnant or regressed performance. This contract allows logistics to plan ahead, beyond the 1-year contracts and represents a planned next step in further reducing overall operations and support costs for the F-35 program. The savings will be achieved through improved cost and velocity in our supply chain, and continued Reliability Maintainability Improvement Projects (RMIP). This contract also lays the groundwork for a future 5-year demand reduction supply chain focused Performance Based Logistics (PBL) contract which will deliver improved performance at same or lower cost.

AFFORDABILITY

The F-35 continues to meet Marine Corps established affordability metrics while providing unprecedented capability. In steady-state, with F-35 procurement complete, the annual total ownership cost for F-35 (the entirety of Marine TACAIR), will be less than 23% of the annual Marine Aviation Total Obligation Authority (TOA), assuming a conservative flat topline.

F-35 LIGHTNING II (VMFA) PLAN

RESERVE INTEGRATION

The transition of VMFA-112 and the standup and recapitalization of VMFA-134 to the F-35 will remain a critical part of the TACAIR roadmap and the reserve component's ability to augment, reinforce, and sustain the active component. A reserve Squadron Augment Unit (SAU) has been established at VMFAT-501 in Beaufort in order to assist with FRS pilot production while also building a stable of F-35 reserve pilots. Additionally, a reserve SAU is being established at VMFAT-502 in Miramar.

INITIATIVES AND WAY AHEAD

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

Continued TACAIR Transition to F-35

- VMFAT-502 will grow from 16PAA to 25PAA in FY23 (in line with increasing pilot production requirements)
- VMFA-214 will achieve IOC in FY23
- VMFA-542 and VMFA-311 will achieve IOC in FY24
- VMFA-533 and VMFA-251 will achieve IOC in FY25
- VMFA-225 is IOC and should declare FOC in the summer of FY22

Modernization

- Tech Refresh 3
- Wide Area Sea Search

- Band 5 MADL
- Multi-ship IRST Increment I/II
- Integrated Fire Control Increment I/II
- Band 2/5 RWR
- Beyond Line of Sight (BLOS) communications
- Expanded SAR Modes
- Expanded Electronic Protection and Electronic Attack
- Electronic Support Measures (ESM) upgrades
- Countermeasure Updates
- Improved Combat ID
- JPALs, RNP/RNAV
- SATURN
- Tactical Data Recording
- External Fuel Tanks (F-35B)

Weapons Integration

- Net-Enabled SDB II
- AGM-88G AARGM-ER
- AGM-154 Joint Standoff Weapon C1 MMT (F-35C)
- AGM-158 Family of Weapons (JASSM-ER and LRASM)
- GBU-38 500-lb JDAM
- GBU-54 500-lb Laser JDAM
- Six-in-the-Bay (F-35C)
- AIM-9X Block II+

Training Improvements

- Networked simulation capability at every F-35 base
- Low-cost simulator to increase local simulation capacity
- TCTS II Integration
- Improved Embedded Training



Twenty U.S. Marine Corps F-35B Lightning II aircraft aboard USS *Tripoli* as she puts to sea for operational test of the Lightning Carrier concept, April 2022



F/A-18 HORNET (VMFA) PLAN

VALUE TO THE MAGTF

The F/A-18 Hornet today provides over 50 percent of Marine Corps TACAIR capability, and remains the only TACAIR platform capable of delivering the wide range of weapons required during contingency operations. The pacing threat is met with an aggressive modernization program which will increase survivability and lethality against both air and surface threats on the modern battlefield, and enable Hornet to continue executing assigned Mission Essential Tasks. Hornet's wide breadth of weapons, advanced LITENING targeting pod, network interoperability, and upgraded electronic warfare systems highlights the platform's continued relevant, lethal and survivable capability to the MAGTF and combatant commanders in support of the National Defense Strategy. Likewise, the Hornet program remains critical for successful transition to the F-35 in support of Force Design.

Although planned F/A-18 operations have ceased in the CENTCOM AOR, Marine Aircraft Groups 11, 31 and 41 continue to source Hornet combat capability to the Indo-Pacific. VMFA-323 completed the final F/A-18A-D Tactical Aircraft Integration deployment with Carrier Air Wing 17 in February 2021.

Additionally, continued participation in joint and coalition exercises testing and evaluating Force Design initiatives, such as long range strikes utilizing the Expeditionary Advanced Base Operations concept, demonstrate the Hornet community's preparation for contingencies across the globe and alongside our joint and coalition partners.

MISSION STATEMENT

The F/A-18 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): 0.72M – 0.85M / MACH 1.8

Configuration

- Weapons Stations: Nine
- Armament Air-to-Air: AIM-9, AIM-120, 20mm Gun; Air-to-Surface: 20mm Gun, APKWS, GP Bombs, Cluster Munitions, Laser Guided Weapons, GPS Guided Weapons, Dual Mode Weapons, HARM/AARGM, Harpoon, SLAM-ER
- Sensors: APG-73 RADAR, AN/AAQ-28 LITENING Pod Gen 4, JHMCS; Networked Systems: LINK 16, LITENING ROVER downlink, VMF
- ASE: ALE-39/47; ALQ-126B, 165, 214v5; ALR-67v2/3

Notional Mission Profile (AMT)

- Range/Time on Station (TOS)- 200nm transit, 1+00 TOS, 200nm RTB
- Loadout- (4) AGM-84D, (2) AIM-9X, (2) AIM-120, (578) 20mm



The commanding officer of the VMFA-323 “Death Rattlers” prepares for the final catapult shot of a Marine Corps F/A-18C, as the squadron lines the foul line. Final Marine Corps TAI deployment, USS *Nimitz*, February 2021.

F/A-18 HORNET FUNDING PRIORITIES

1. APG-79(v)4 AESA RADAR – increased airborne, land and maritime target detection and engagement in support of the MAGTF
2. EW Survivability Enhancements (AESA Integration, ALQ-214v5 SWIP) – provides awareness and reaction against peer and near peer threats to sustain the airframe through the transition to F-35
3. Net Enabled / Extended Range Weapons (JASSM, Harpoon Blk II+, JSOW C-1) – enables weapon employment in contested environments
4. Beyond Line of Sight Communications – provides targeting for Net Enabled / Extended Range weapon employment



A U.S. Marine Corps F/A-18D Hornet assigned to the VMFA(AW)-533 “Hawks” finishes refueling over the Syrian Arab Republic.

F/A-18 HORNET (VMFA) PLAN

ORGANIZATION

The F/A-18 is the primary bridging platform to F-35, and for the next eight years provides significant combat capability in support of the National Defense Strategy as the Marine Corps fields the F-35 fleet. The program will continue to invest in modernization efforts ensuring lethality, survivability and availability requirements of the F/A-18 during operations primarily in Indo-Pacom. The platform will sundown in 2030 as F/A-18 squadrons transition to F-35 in accordance with the TACAIR transition.

The USMC fleet is comprised of six active Hornet squadrons and one reserve Hornet squadron. The preponderance of F/A-18 squadrons are assigned to MAG-31 at MCAS Beaufort, SC with additional squadrons assigned to MAG-11 at Marine Corps Air Station Miramar, CA, and MAG-41 at Joint Reserve Base Fort Worth, TX. Additionally, VMFAT-101 will continue to support aircrew training responsibilities as the only remaining F/A-18 Hornet Fleet Replacement Squadron in the Department of the Navy.

Five of the six active squadrons are composite squadrons designed to consist of 7 x F/A-18Cs, 5 x F/A-18Ds, 6-7 WSOs, and 14-16 pilots. The composite squadron helps mitigate TACAIR transition manpower constraints and retains our WSO talent in the community. It ensures each squadron preserves enough officers to operate effectively, in addition to retaining some of the resident Forward Air Controller (Airborne) capability that currently exists.

VMFA-323 and VMFA-112 are the only two squadrons that will not composite prior to transition to F-35.



Marines with VMFA-115 conduct integrated training with the Finnish Air Force at Rissala Air Base, Kuopio.

F/A-18 HORNET (VMFA) PLAN



VMFA-312 TransPac to Unit Deployment Program, 2021

SUSTAINMENT

As an out-of-production aircraft, the F/A-18 program is focused on addressing inventory management, readiness degraders, solving chronic material shortfalls, and closing the Mission Capable gap towards the SECDEF directive of 80%. Due to the increased maintenance requirements at the squadron level driven by the aging platform, multiple initiatives exist to increase readiness:

- Resource squadrons with no more than 14 aircraft (12 PAA plus 2 spares).
- PMA and TYCOM-managed Stricken Aircraft Reclamation and Disposal Program ensure adequate parts supply while reducing overall NAVSUP costs.
- Increase engineering support availability on the flight line.

- Increase test bench reliability/capacity.
- Actively manage “maintenance capacity” to maximize aircraft touch time.

A strategic review of every BUNO in the F/A-18 total active inventory is conducted biannually to ensure squadron resourcing and aircraft availability through the sundown of the platform. Individual aircraft flagged for watch are reviewed bi-weekly.

The bi-annual review identifies “best of breed” aircraft for the fleet necessary for aircraft modernization efforts through Hornet sundown. It also ensures “return on airframe investment” for aircraft completing depot events.

Part of the overall sustainment plan also includes utilization of the Level 3 preservation facility aboard MCAS Miramar. This facility will reduce the number of assigned aircraft at the squadron level, decreasing administrative burden and enabling more aircraft touch time for in-reporting aircraft. Concurrently, it provides a “ready bench” of aircraft to mitigate unplanned attrition in order to effectively manage the Hornet inventory through sundown.

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). Contract Maintenance Support helps fill this void to make a positive impact on readiness.

F/A-18 HORNET (VMFA) PLAN

The F/A-18 Structural Life Management Program (SLMP) consists of the Center Barrel Replacement Plus (CBR+) and High Flight Hour (HFH) inspection programs. The CBR+ has extended the service life of numerous Lot 17 and below aircraft and the HFH inspection will extend the life of the F/A-18 aircraft to 10,000 hours.

Only six aircraft remain to complete CBR+, and the preponderance of depot level maintenance will be complete by FY25.

In parallel with SLMP, Air Vehicle Readiness incorporates a combination of inspections, repairs and a number of Engineering Change Proposals to support Hornet mission capability.

RESERVE INTEGRATION

VMFA-112 is the Marine Corps operational reserve squadron. This squadron will support total force TACAIR requirements until it transitions to the F-35 in the FY30 timeframe. Currently supporting the Unit Deployment Program, VMFA-112 will continue to activate and provide GFM tasking for the Marine Corps.

VMFA-112 will retire the remaining four F/A-18A++ in FY22, to be replaced by F/A-18C+ and “best of breed” F/A-18C aircraft. AESA capability is planned for the FY25 timeframe ensuring our reserve capacity remains relevant, lethal and survivable to the MAGTF and combatant commanders.



VMFA-232 supports Exercise Red Flag Alaska, 2020

F/A-18 HORNET (VMFA) PLAN

INITIATIVES AND WAY AHEAD

Hornet's breadth of weapons, advanced LITENING targeting pod, network interoperability, and electronic warfare systems provides relevant, lethal and survivable capability to MAGTF and combatant commanders through the TACAIR transition to F-35. With the initial delivery of the APG-79(v)4 scheduled for spring 2022, the F/A-18 Hornet will modernize its existing mechanically scanned RADARs to AESA technology. This advancement, coupled with electronic warfare suite modernization, the pursuit of Net Enabled and extended range weapons, and Beyond Line-of-Sight communications, maintains Hornet's combat capability in support of the National Defense Strategy until platform sundown in 2030.

- Avionics and software upgrades (AESA, LINK-16 CMN-4)
- Weapons modernization (Mixed loads, Net Enabled Weapons, Extended Range Weapons)



- Digital interoperability (LITENING ATDL, BLOS communication)
- Increased survivability (ALR-67v3, ALE-47, ALQ-214v5, NAVWAR)
- Readiness (DRI, PMI 1X/2X, CMS, PEMA Wireless, FAME Improvements)
- Safety (CPOMS, AGCAS, HhART)

RECENT/FUTURE UPGRADES

SCS-29C+ – 2021 (AIM-9X 360 LAR, LPOD improvements)
SCS-29C* – 2022 (AESA integration, AGCAS, mixed weapon loads)
SCS-31C – 2024 (Full AESA integration, LNAV/VNAV, EW survivability enhancements, NAVWAR, NE/Extended Range weapons)

LETHALITY

APG-79v4 AESA RADAR – 2022
Net Enabled Weapons | Extended Range Weapons – 2024

SURVIVABILITY

ALQ-214 v5 – 2018, SWIP 2024
ALR-67 v3 – 2018
NAVWAR GPS – 2024

INTEROPERABILITY

LINK-16 MIDS JTRS (CMN-4) – 2021
LITENING ATDL - 2024

SAFETY ENHANCEMENTS

Cabin Pressure and OBOGS Monitoring System (CPOMS) – 2021
Auto Ground Collision Avoidance System (AGCAS) – 2023



AV-8B HARRIER (VMA) PLAN

VALUE TO THE MAGTF

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

AV-8B squadrons and detachments continue to execute deployed operations on MEUs. As an enduring mission they **maintain 6 to 12 aircraft deployed on MEUs with 6 to 12 aircraft in workup.**

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

MISSION STATEMENT

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

CAPABILITIES

Aircraft Specifications

- Empty weight: 14,912 pounds
- Max gross weight: 32,000 pounds
- Payload (fuel plus ordnance) : 17,000 pounds
- Speed (cruise/max): 360 kts / 585 kts

Configuration

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

Notional Mission Profile

- OAS
 - Range/Time on Station (TOS)- 200nm transit, 1+00 TOS, 200nm RTB
 - Loadout- (3) 500# PGM (JDAM/LGB), (7) 2.75" APKWS rockets, (300) 25mm, External Fuel Tanks, LITENING POD

AV-8B HARRIER FUNDING PRIORITIES

1. T402 engine readiness – Enables sustainment of AV-8B to support F-35 transition on east coast
2. LINK-16 Full integration – increases relevancy and lethality to full digital operability for LINK 16 to effectively operate in the joint environment.
3. Fleet Replacement Squadron Contract Support – Ensure capacity and material readiness of FRD to meet PTR and facilitate adequate active duty manpower assigned at VMAs.
4. Weapons Upgrades – Increase lethality to provide MEUs with relevant and lethal CAS, Strike and SCAR platform until transition to F-35.
(AIM-9X, AIM-120C, JSOW, APKWS improvements)



A U.S. Marine Corps AV-8B Harrier II assigned to Marine Attack Squadron 542 (VMA-542) lands aboard the *Wasp*-class amphibious assault ship *USS Bataan* (LHD-5).

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 four active operational squadrons comprised of 14 AV-8B aircraft each and an FRD comprised of AV-8B and TAV-8B aircraft.

The Marine Corps will maintain four operational squadrons until FY22. West

Coast VMAs complete transition to F-35 in 3rd quarter FY22; the East Coast maintains operations until FY27.

FRD

The FRD has completed its transition from an FRS and is now operating under VMA-223.

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

U.S. Marine Corps AV-8B Harrier II aircraft conduct combat operations over the Syrian Arab Republic.



AV-8B HARRIER (VMA) PLAN

SUSTAINMENT

The current AV-8B active inventory consists of 62 aircraft. There are 6 TAV-8B training aircraft and 56 radar aircraft. The AV-8B fleet is currently fulfilling, with four squadrons, the operational commitments previously filled by seven squadrons.

We have seen an increase in readiness across the fleet . We continue to address our MC degraders through the engagement of the program office, TMS lead (MAG-14 Commanding Officer), and HQMC. The Maintenance Capacity Model (MCM) lessons learned led us to add 129 contract maintainers through the Contractor Logistics Sundown Sustainment Strategy, or CL3S. These maintainers will support the Marines and enable readiness through the sundown of the AV-8B. These initiatives along with constant assessment and adjustments will continue to drive the method the AV-8B program is using to sustain fleet readiness.

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



AV-8B HARRIER (VMA) PLAN

INITIATIVES AND WAY AHEAD

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

This evolution over the next five years will focus on:

Avionics and software upgrades (LINK-16, RNP/RNAV, Mode 5/S)

Weapons modernization (AIM-9X Block II, AIM-120C, APKWS warhead and envelope expansion, precision stand off weapons)

Digital interoperability (LITENING ATDL, VMF, KY-58 VACM)

Readiness (PRE/PRL, F402 engine safety/reliability, FOD programs)

H7.0 OFP

H7.0 was released in FY21 and brings additional weapons capabilities to the AV-8B. APKWS integration improvements and JSOW integration are incorporated into H7.0, as well as a number of software improvements.

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

H7.1 OFP

H7.1 is scheduled for release in FY22 and brings enhanced avionics and weapons capabilities to the AV-8B. Full LINK-16 integration will be completed in all AV-8B II + Radar aircraft; this expands on LINK-16 message sets included in H6.2 (FY18) and includes fighter-to-fighter messages. Additionally, AIM-9X Block II will also be integrated onto the AV-8B, as well as ADS-B out (FAA signaling, the precursor to TCAS), and full Mode 5/S.

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

LITENING ADVANCED TACTICAL DATA LINK

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

These waveforms integrate key components of SRP onto our legacy TACAIR assets and provide expanded capabilities such as two way datalink of video and still pictures, as well as make LITENING ATDL equipped aircraft airborne nodes for HQMC Aviation DI initiatives. LITENING ATDL is currently scheduled for initial fielding to the fleet concurrent with H7.2 in FY23.

AV-8B HARRIER (VMA) PLAN

FUTURE UPGRADES

Mode 5 / Mode S – CY 2022
ADS-B (Out) – CY 2022
Crypto Mod – CY 2022
A/G Gun Reticle Improvements – CY 2022
STA 1 and 7 1760 Cable – CY 2022

LETHALITY

AIM-9X Block II – CY 2022
AIM-120C expanded capabilities – CY 2022
Precision Stand Off Weapon – CY 2022

INTEROPERABILITY

LITENING Gen 4 Advanced Tactical Data Link – CY 2023
LINK-16 Full AV-8B Integration – CY 2022

A U.S. Marine Corps AV-8B Harrier II assigned to Marine Attack Squadron 214 (VMA-214) conducts a show of force during TIGER STRIKE in the Republic of the Philippines.





KC-130J HERCULES (VMGR) PLAN

VALUE TO THE MAGTF

The KC-130J remains a critical enabler for forward deployed MAGTF success, and this capability has been continuously deployed since 2005. Today VMGR-152 is in Iwakuni, Japan and VMGR detachments are supporting North Africa Response Force and East Africa Response Force. Additional KC-130J capacity will be added with the activation of VMGR-153 aboard MCAS Kaneohe Bay, Hawaii in fiscal year 2023. This will increase the mobility of the Marine Littoral Regiment while also growing the logistical capacity to sustain forces in Expeditionary Advanced Base Operations.

Deploying elements are capable of conducting operations within 24 hours of arrival, providing the immediate ability to rapidly extend the operational reach of the MAGTF and, for detachments equipped with Harvest HAWK, provide organic multi-sensor imagery reconnaissance (MIR) and close air support (CAS).

MISSION STATEMENT

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

CAPABILITIES

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 incorporation of MAGTF Agile Network Gateway Link will allow the KC-130J to be a critical enabler for the digital information exchange within the MAGTF as well as the naval, joint, and coalition operating environment.

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)

Aircraft Specifications KC-130J

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

Survivability Equipment

- Radar Warning Receiver
- Advanced Missile Warning System
- Advanced IR Countermeasure System
- Advanced Countermeasure Dispenser System
- DoN LAIRCM/ATW with HFI

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

KC-130J HERCULES (VMGR) PLAN

Harvest HAWK

A total of 10 aircraft are modified to employ the 7 Harvest HAWK kits:

5 modified aircraft with 3 kits in 2d MAW, and 4 modified aircraft with 3 kits in 3d MAW, and 1 modified aircraft with 1 kit at VX-20. Only VMGR-252 and VMGR-352 are trained and equipped to provide MIR and CAS.

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

Integration of BLOS provides improved battlespace situational awareness and battle management through world-wide coverage. The Mission Operators Pallet (MOP) transmits simultaneous electro-optical (EO), infra-red (IR), and video in command (VIC) HD/SD video sensor stream onto the BLOS network. BLOS will further enable USMC Networking On-The-Move (NOTM) initiatives by transmission of MOP Key-Length-Value (KLV) sensor feed data.

The MOP will also integrate SIPRNet communication networks. The HH system facilitates a higher degree of battlespace management via its onboard systems and sensors. The situational awareness the MOP provides a mission commander allows quick and decisive action within the battlespace.



A U.S. Marine Corps KC-130J assigned to Marine Aerial Refueler Transport Squadron 152 conducts air delivery of paratroopers with US Army 25th Infantry Division aboard Joint Base Elmendorf-Richardson, Alaska, 2020.

KC-130J HERCULES FUNDING PRIORITIES

1. Complete KC-130J procurement by 2024 – aircraft capacity and readiness for Force Design and INDOPACOM
2. Support equipment/IMRL – critical for airframe employment in distributed operations
3. Aircraft Survivability Equipment (DoN LAIRCM) – counters near peer threats
4. Block 8.1 mission computer upgrade – increased connectivity and lethality as a component of the MAGTF
5. Dowty R391 propeller sustainment – increased aircraft reliability
6. Digital interoperability integration – provides an aerial hub to the MAGTF



A KC-130J from Marine Aerial Refueler Transport Squadron 352 conducting tactical displacement and relocation of the Navy Marine Expeditionary Ship Interdiction System aboard Pacific Missile Range Facility Barking Sands, Hawaii, 2021.

KC-130J HERCULES (VMGR) PLAN

ORGANIZATION

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

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

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

The Marine Corps has delivered 74% of the required KC-130J aircraft and transition is complete for the active component. Total procurement is for a program of record of 86 KC-130Js with the last delivery scheduled for 2027.

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

- 4 active squadrons x 15 PMAI / 2 BAI
- 1 reserve squadron x 10 PMAI / 2 BAI



- 1 reserve squadron x 5 PMAI
- 1 test squadron x 1 PDAI

SUSTAINMENT

The **biggest factor in readiness and KC-130 availability is lack of aircraft on the flight line**. The delayed delivery of backup aircraft until after FY24 coupled with excessive turn-around-times for scheduled depot events is directly impacting VMGRs support to the operating forces.

While funding for aircraft procurement remains stable and backup aircraft are still scheduled for delivery in FY24, the ability to conduct planned maintenance inspections (PMIs) with a turn-around-time of 160 days continues to be a problem.

VMGR TRANSITION PLAN

Unit	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32
VX-20	2KJ→1KJ		Patuxent River										
VMGR-252	12KJ→17KJ		Cherry Point										
VMGR-352	12KJ→17KJ			Miramar									
VMGR-152	12KJ→17KJ				Iwakuni								
VMGR-153				17 KJ - In transition		Kaneohe Bay							
VMGR-452	12KT→5KJ		Stewart										
VMGR-234	8KJ→12KJ								Fort Worth				

Test SQDN

Active sqdn

Reserve SQDN

FOC

Notes:
 Each squadron completes transition when able to report C-3 or greater in DRRS signifying deployability

VMGR-153 is in transition

KC-130J HERCULES (VMGR) PLAN

In FY18, CONUS events began a transition from Ogden Air Logistics Complex to Warner Robins Air Logistics Complex. This transition was halted at the end of FY19 and Ogden was the only facility in use. In order to meet the FY20 demand, a Contracted Maintenance, Modification, Aircrew and Related Services (CMMARS) Program offload contract was awarded to L-3 in Waco, Texas in order to reduce the PMI burden at Ogden Air Logistics Complex.

In FY21, FRC WESTPAC awarded depot contracts at Cascade Aerospace in Canada and Marshall Aerospace in the United Kingdom. Overall, PMI turn around times have begun to reduce, however supply chain issues continue to stymie progress.

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 parts. NAVSUP and Defense Logistics Agency are providing continued support with some improvements being realized. The KC-130 team continues to work closely with all supporting entities to address current supply shortfalls, improve forecasting, and drive down the overall impact of non-mission capable supply issues to the fleet.



Marines assigned to Marine Aerial Refueler Transport Squadron 352 (VMGR-352) conducting maintenance on a KC-130J aboard Marine Corps Air Station Miramar, CA, 2021.

RESERVE TRANSITION AND 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 began transition to KC-130J in FY19. BAI procurement is deferred until the reserve component reaches 15 aircraft and will complete delivery in FY27.

KC-130J HERCULES (VMGR) PLAN

INITIATIVES AND WAY AHEAD

KC-130J BLOCK UPGRADE PROGRAM

The USMC participates in a joint users group with the USAF and seven international partner nations to reduce costs associated with the development and fielding of updated baseline configurations resulting from emerging requirements and diminishing manufacturing sources. These new configurations include system and safety improvements and satisfy known CNS/ATM mandates. Block 8.1 is the new baseline for all DoD and international C-130J users, which includes Link 16, Mode 5 IFF, GPS approach capability, ADS-B (out), RNP/RNAV, and a new flight management system

HARVEST HAWK

The obsolescence upgrades to Harvest HAWK aircraft became available for tasking in FY20. All remaining Harvest HAWK aircraft completed modifications in FY21. Windows 10 integration into the MOP is expected to complete in FY22. MANGL and BLOS integration is expected to be complete in FY23.

Joint Air Ground Munition and Griffin Block IV testing is scheduled for FY26 and FY27.

LETHALITY

- Griffin Block III, Block IV
- JAGM integration

ASE/SURVIVABILITY

DoN LAIRCM/ATW with HFI, AAQ-24B(V)25 – 19 modifications and 5 new production deliveries completed through FY21.

EW

ALQ-231 (V) (Intrepid Tiger II) Block X development and integration will provide Electromagnetic Spectrum Operations (EMSO) and Electronic Warfare (EW) suite of equipment integrated into KC-130J. The interface of the system is envisioned to be a tablet device which allows the operator to control or monitor the IT II system as missions progress. IT II systems will be networked through Spectrum Services Framework which will provide a capability for the payload to share spectrum information with other users. Development is scheduled to begin in FY23.

INTEROPERABILITY

MANGL/Digital Interoperability begins developmental test in FY23. This modification will enable real-time tactical cognizance and decision-making through sharing of the Common Operational Picture, including asset position, capabilities, intent and threat information. MANGL will also include advance waveforms that will enable exchange of tactical imagery and video. This capability will improve operations in denied and degraded environments, and enables range extension and distributed operations.

Block 8.1 – Fleet modifications began in FY22.

ARC-210 – Upgrading the radio to the Gen 6 Mobile User Objective System (MUOS) will maintain Secure over-the-horizon communications, compliant with NSA 09-01A for Tactical Secure Voice.

OPERATIONAL TEST AND EVALUATION

Block 8.1.1 software testing will commence in FY22.



A section of KC-130Js from Marine Aerial Refueler Transport Squadron 234 conducting air-to-air refueling with a division of French Mirage fighters, Combined Joint Task Force-Horn of Africa, Djibouti, 2021.



MV-22B OSPREY (VMM) PLAN

VALUE TO THE MAGTF

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

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

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

The Marine Corps is in the midst of revolutionary change and the Osprey *will* be an integral platform of FD 2030 and beyond. For the past two decades the MV-22 has been changing the calculus on what is the realm of possible and this will only continue as the USMC further refines future operating concepts such as EABO to support joint, naval, and Fleet Marine Forces.

MISSION STATEMENT

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



MV-22B OSPREY (VMM) PLAN

CAPABILITIES

Aircraft Specifications

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

Configuration

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

Notional Mission Profile

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

- Amphibious troop lift
 - Flight profile- Take-off no wind, sea level; 50 nm transit to 3000 ft MSL, 40 min loiter overhead; return to ship with 15 min loiter at ship
 - Payload- 24 combat-equipped Marines or ITV with 3 Marines
- Amphibious external lift
 - Flight profile- Pick up no wind, sea level; 50 nm transit to 3000 ft MSL CAL; 5 min HOGE in zone; return to ship with 15 min loiter at ship
 - Payload- 10,000 external cargo load
- Land assault troop lift
 - Flight profile- Take-off from CAL at 3000 ft MSL; transit 200nm to 3000 ft MSL CAL; return to point of origin
 - Payload- 24 combat-equipped Marines or ITV with 3 Marines
- Land assault external lift
 - Flight profile- Pick up no wind, HOGE, 3000ft MSL; 50 nm transit to 3000 ft MSL CAL; 5 min HOGE in zone; return to point of origin.
 - Payload- 10,000 external cargo load
- Self-Deploy
 - Range- 2100nm at 10,000 MSL with 20 min fuel reserve at each refuel point in 12 hours or less

MV-22B OSPREY FUNDING PRIORITIES

1. Block B – C upgrade and capability improvement modernization program – enables digital interoperability and advanced warfighting capabilities for the MAGTF
2. Expeditious implementation of Nacelle Improvements – enhances reliability and maintainability of the airframe
3. Degraded Visual Landing System initiative – rapid emplacement and displacement of the expeditionary force with increased mission safety



U.S. Marine Corps MV-22B Osprey aircraft with Marine Medium Tiltrotor Squadron 362 (VMM-362) “Ugly Angels” approach a landing zone, carrying Marines from 3rd Battalion, 1st Marine Regiment, March 2020.

MV-22B OSPREY (VMM) PLAN

ORGANIZATION

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

The Marine Corps will procure to a program of record of 360 MV-22Bs in the following squadron bed-down:

1. 14 active squadrons x 12 MV-22B
2. 2 reserve squadrons x 12 MV-22B
3. 1 fleet replacement squadron x 27 MV-22B


The Marine Corps is complete with the medium lift transition. There are fifteen squadrons in the active fleet and 2 reserve component squadrons. Force Design 2030 has reduced the total squadron end strength from eighteen squadrons to fourteen squadrons. VMM-264 was deactivated in FY20, VMM-166 was deactivated in FY21 and the final VMM deactivation will occur in FY22.


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



VMM TRANSITION PLAN

	FY16	FY17	FY18	FY19	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32	FY33	FY34
VMMT-204	27 MV-22B		New River						★ Reduce to 24 PTAA										
VMM-162	12 MV-22B		New River																
VMM-261	12 MV-22B		New River																
VMM-263	12 MV-22B		New River																
VMM-264	12 MV-22B		New River		★														
VMM-266	12 MV-22B		New River																
VMM-365	12 MV-22B		New River																
VMM-161	12 MV-22B		Miramar																
VMM-163	12 MV-22B		Miramar																
VMM-165	12 MV-22B		Miramar																
VMM-166	12 MV-22B		Miramar		★														
VMM-268	12 MV-22B		Kanehoe Bay																
VMM-363	12 MV-22B		Kanehoe Bay																
VMM-262	12 MV-22B		Okinawa																
VMM-265	12 MV-22B		Okinawa																
VMM-764 (RES)	12 MV-22B		Miramar																
VMM-364	12 MV-22B		Camp Pendleton																
VMM-164	12 MV-22B		Camp Pendleton					★											
VMM-774 (RES)	12 MV-22B		New River																
VMM-362			12 MV-22B																
VMM-212				★	Decision to stand-up cancelled for FY19 FD 2030														
HMX-1 (EXEC SPT)	12 MV-22B		Quantico																
HX-1 (DT)	5 MV-22B		Pax River																
VMX-1 (OT)	6 MV-22B		Yuma																

 This signifies the transition of structure from the legacy CH-46E platform to the MV-22B
 The left side aligns with the redesignation of the squadron on in Qtr 1 of transition FY
 The right side aligns with the squadron achieving its safe-for-flight
 Legacy flight ops cease during this period based on operational requirements

 This signifies the decision to decommission this squadron
 During this period aircraft and personnel transferred to other squadrons, operations reduced as required
 ★ Signifies Squadron fully decommissioned

FRS SQDN	FLEET SQDN	EXEC SUPT	TEST SQDN
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MV-22B OSPREY (VMM) PLAN

SUSTAINMENT

The V-22 Readiness Program (VRP) is a holistic approach to platform readiness recovery. It encompasses all training, sustainment, and platform modification initiatives that contribute to the goal of meeting the USMC readiness benchmark of 75%. The two largest initiatives under VRP are a configuration management and capability Improvement program and Nacelle Improvement (NI). Configuration management and supply chain management remain critical for the long term health of the MV-22. HQMC Aviation will focus on delivering the capability needed to support Force Design 2030 to the fleet as expeditiously and cost effectively as possible. The B-C capability enhancement program will bring all Block B aircraft to a Block C configuration and focus on incorporating specific capability and safety engineering change proposals (ECPs) necessary to implement critical capability improvements to remain relevant and effective on the future battlefield.

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

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

Naval Sustainment System- Aviation is another initiative. The NSS-A support pillars include end-to-end supply chain reform; engineering reform; Fleet Readiness Center reform (to include the Intermediate and Depot levels of maintenance); governance, accountability, and organization; the stand-up of a Maintenance Operations Center for Aircraft-On-Ground (MOC/AOG); and Organizational-Level Maintenance Management (OLMM) including several tool sets to manage maintenance processes. OLMM is being fielded in the MV-22B community after success in several Navy Type Wings.

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



MV-22B OSPREY (VMM) PLAN

RESERVE INTEGRATION

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

4th MAW stands by to alleviate stresses in the fleet Marine force operation tempo in

support of enduring requirements or to augment Active Component forces in the eventuality of a major combat action.

VMM-774 will relocate to MCAS New River in FY22. This move will streamline the logistics supply chain and increase interoperability with other tenant fleet squadrons in MAG-26.



MV-22B OSPREY (VMM) PLAN

INITIATIVES AND WAY AHEAD

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

Its evolution over the next two years will focus on:

Capabilities, readiness and sustainability for the growing fleet.

Improving Degraded Visual Environment (DVE) flight capabilities including development of a new flight control computer to improve aircraft handling qualities, and incorporation of Enhanced Visual Acuity (EVA) and development of a helmet tracking capability and an image processor capable of displaying synthetic graphics and virtual LZ symbology to alleviate pilot workload in a DVE.

Aircraft survivability equipment upgrades. Digital Interoperability including the MAGTF Agile Network Gateway Link (MANGL) to bring on Link 16, CDL, ANW2 and TTNT. Adding mission kits to support expanded mission sets like Network On The Move-Airborne (NOTM-A), IT-II Block X V4, and other sensor packages.

AIRFRAME IMPROVEMENTS, SPECIFICS, TEST

The current CC-RAM modification program will transform into a tailored configuration and capability enhancement program that focuses on delivering the capabilities required to support Force Design 2030 concepts. This plan will prioritize necessary capability foundations and expedite delivery to the fleet while maintaining the program within budgetary constraints. The effort will bring all block Bs to a Block C configuration and provide the infrastructure to implement advanced capabilities necessary on the modern battlefield. These will ensure that the MV-22 maintains its battlefield superiority while improving readiness at a lower cost.

DEGRADED VISUAL ENVIRONMENT (DVE)

The design of the MV-22 poses unique challenges when operating in a dusty or obscured environment. In order to safely operate in its all-conditions role, the MV-22 requires a suite of capabilities; improved flight control logic to improve aircraft handling qualities, improved visualization and sensors, improved pilot cueing and open system avionics architecture necessary to host the system of systems. The MV-22 program is leading the way to integrate the DoN Enhanced Visual Acuity (EVA) digital night vision improvement program with a helmet tracking and synthetic virtual environment capability (Degraded Visual Landing System (DVLS)) to provide pilots with an 'outside' scan capability during DVE.



UH-1/AH-1 (HMLA) PLAN

VALUE TO THE MAGTF

The H-1 program consists of the AH-1Z Viper and the UH-1Y Venom aircraft : “upgrades” aircraft that will continue a lineage of H-1 battlefield relevance and dominance well into the future. H-1s are manned, trained and equipped to fight from the sea into austere environments and confined littoral spaces. The Viper and Venom work in concert with naval and joint force capabilities to sense, shoot, survive, and sustain inside the Weapon Engagement Zone (WEZ); they are a kill web enabler and effector, expand depth, range, communication, and provide lethality options available to the commander.

The program fully delivered all upgraded Venom in FY18 and will complete deliveries of the Viper in FY22. As the current H-1 fleet moves from procurement phase to one of sustainment, modernization, and capacity, it will inform future Marine Corps vertical lift concepts and capability.

MISSION STATEMENT

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

The advanced cockpit of the H-1, reduces operator workload, improves situational awareness and provides growth potential for future kinetic and non-kinetic weapons and joint digital interoperability capabilities. In

addition, H-1s support the full spectrum of warfare in range, combat power, and flexibility while capitalizing on 85% commonality of major components. This streamlines logistical sustainment, flightline maintenance, deployability, and maintainability which has decreased workloads, training timelines, and total ownership cost.

H-1s were designed with shipboard compatibility and the maritime environment in mind, which makes them a commodity for FDNF; particularly, the US Indo-Pacific Command (INDOPACOM) area of responsibility. H-1s are uniquely adept at Distributed Maritime Operations (DMO) in support of Expeditionary Advance Based Operations (EABO) operating from a mix of traditional amphibious and non-traditional military and civilian shipping as well as shore based austere sites conducting: force protection, precision fires, networked targeting, maritime strike and early warning in support of sea-control and sea-denial operations. As the Marine Corps’ Concept for EABO evolves, so will the potential mission sets of the H-1. Anti-surface warfare and anti-submarine warfare in support of sea-denial/sea-control are two areas where H-1’s have already proved worthy through recent experimentation and exercise. These missions will inform future H-1 Training and Readiness Manual updates, manpower and force laydown studies, capabilities, Table of Organization and Equipment updates and tactics, techniques and procedures.

UH-1/AH-1 (HMLA) PLAN

CAPABILITIES

AH-1Z

Aircraft Specifications

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

Configuration

- Weapons Stations: 6
- Armament:
 - 20mm cannon
 - 2.75" rockets (guided/unguided)
 - AGM-114 Hellfire
 - JAGM
 - AIM-9 Sidewinder
- Sensors: Target Sight System (TSS)
- Networked Systems:
 - Adaptive Networking Wideband Waveform (ANW2)
 - Full Motion Video (FMV)
 - LINK-16
- Aircraft Survivability:
 - APR-39(B)V2/(D)V2
 - AAR-47(B)V2
 - ALE-47
 - DAIRCM

Notional Mission Profile (Offensive Air Support)

- Range/time on station: 110 NM transit, 30 minutes time on station, RTB w/ 20 min fuel reserve. 77 gal aux fuel provides an additional 45 NM or 20 minutes time on station
- Loadout: 8 AGM-114/JAGM
38 2.75" rockets
500 20mm

UH-1Y

Aircraft specifications

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

Configuration

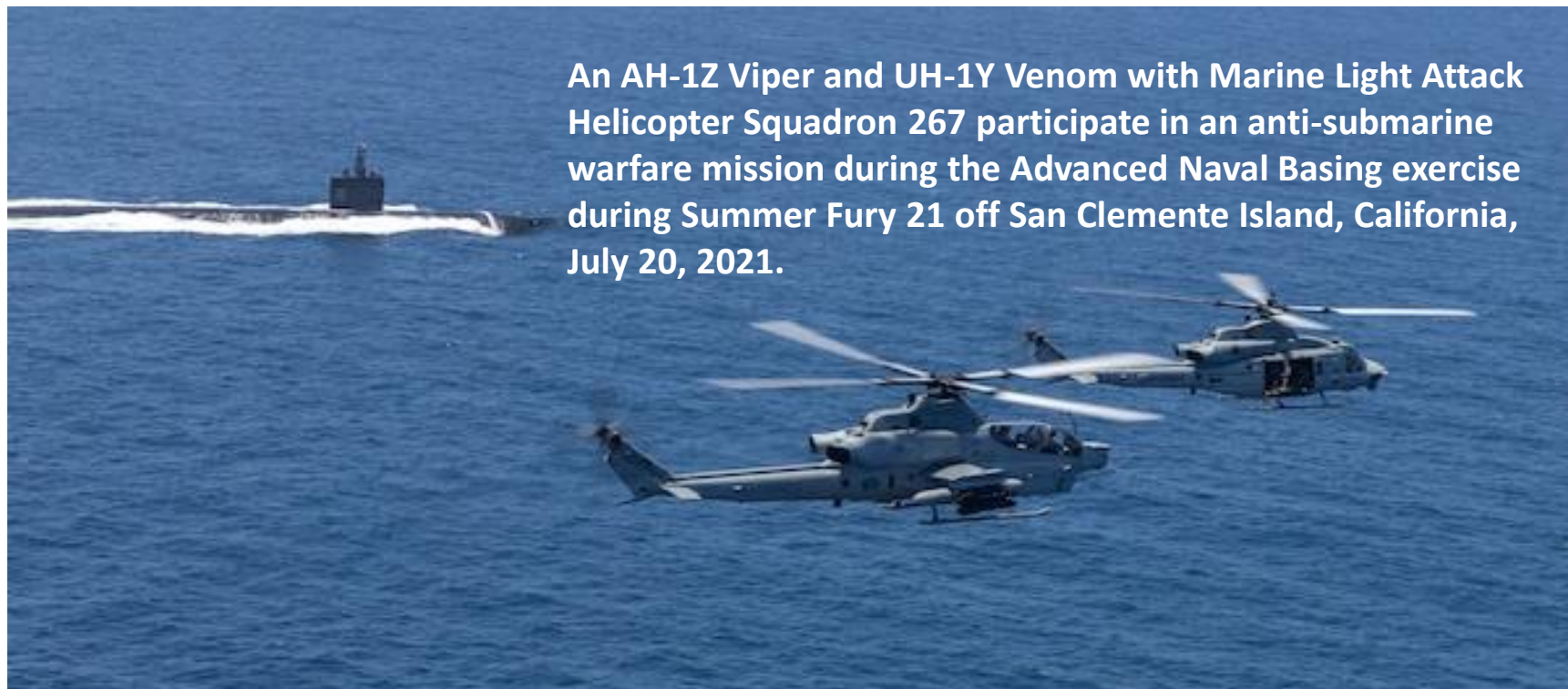
- Weapons stations: 2
- Armament:
 - 2.75" rockets (guided and unguided), GAU-17A, GAU-21, M240D
- Sensors: Brite Star Block II, Intrepid Tiger II
- Networked systems:
 - ANW2, FMV, Tactical Targeting Network Technology (TTNT), LINK-16
- Aircraft Survivability:
 - APR-39(B)V2
 - AAR-47(B)V2
 - ALE-47
 - DAIRCM

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

- Range/time on station: 110 NM transit, 10 minute time on station, RTB w/ 20 min fuel reserve. 77 gal aux fuel provides an additional 30 NM or 15 minutes time on station
- Loadout: GAU-17A
GAU-21
8 combat-loaded Marines

H-1 FUNDING PRIORITIES

1. Digital Interoperability (DI) within the MAGTF and Joint Force:
 - Integrated LINK-16, Adaptive Networking Wideband Waveform (ANW2), Full Motion Video (FMV), and common Marine Corps Gateway
 - Structural Improvement / Electrical Power Upgrade (SIEPU)
2. Survivability against near-peer threats:
 - APR-39(D)V2 fielding
 - Distributed Aperture Infrared Counter Measures (DAIRCM) Program of Record (integrated “under the glass”)
3. Lethality as a component of Force Design:
 - Joint Air-to-Ground Missile (JAGM) testing and fielding towards full capability
 - Structural Improvement / Electrical Power Upgrade (SIEPU)



UH-1/AH-1 (HMLA) PLAN

HMLA ORGANIZATION

CURRENT FORCE PRIMARY AIRCRAFT AUTHORIZATION:

- 7 AC HMLA SQUADRONS
15 AH-1Z, 12 UH-1Y
- 1 RC HMLA SQUADRON
15 AH-1Z, 12 UH-1Y
- 1 RC HMLA SQUADRON (-)
10 AH-1Z, 8 UH-1Y
- 1 FLEET REPLACEMENT SQUADRON
15 AH-1Z, 12 UH-1Y

FUTURE FORCE PRIMARY AIRCRAFT AUTHORIZATION (FY25):

- 5 AC HMLA SQUADRONS
15 AH-1Z, 12 UH-1Y
- 1 RC HMLA SQUADRON
15 AH-1Z, 12 UH-1Y
- 1 RC HMLA SQUADRON (-)
10 AH-1Z, 8 UH-1Y
- 1 FLEET REPLACEMENT SQUADRON
15 AH-1Z, 12 UH-1Y

Force Design 2030 directed the deactivation of two HMLA squadrons. By the end of FY24, active component squadrons will be reduced from 7 to 5. The Total Active Inventory required will be 284 H-1 aircraft.

The Hawaii-based squadron will relocate to the west coast. Four AC west coast squadrons will support global force commitments and MEU detachments operations for the 11th, 13th, 15th, and 31st MEU (Okinawa) as well as the Unit Deployment Program (Okinawa) while one AC east coast squadron will support the 22nd, 24th, and 26th MEU. Ongoing studies on force management will ensure no operational commitments are left unfulfilled.



U.S. Marine Corps H-1s and United States Navy MH-60R aircraft conduct Strike Coordination and Reconnaissance in order to screen for a notional Amphibious Ready Group during a training exercise off the coast of California.

UH-1/AH-1 (HMLA) PLAN

SUSTAINMENT

With upgrades deliveries nearing completion, the H-1 program shifts focus from procurement to sustainment. The sustainment infrastructure strains to meet demand ahead of plan as the system matures and stabilizes. The sustainment system's final posture supports the combatant commander with three Marine Expeditionary Units deployed simultaneously, with deployment detachments of up to five AH-1Z and four UH-1Y aircraft.

In FY19, the H-1 program completed its procurement of upgrade aircraft and marked the shift toward fleet inventory management, modernization, and improved capability/capacity. The Light Attack Aircraft Management Plan (LAAMP) will size the fleet by properly storing and preserving above Primary Mission Aircraft Authorization (PMAA) aircraft, establishing a healthy supply of war and attrition reserve aircraft, and allowing dedicated maintenance man hours to concentrate on improving Full Mission Capable (FMC) rates to enhance H-1 combat readiness and lethality. These efforts have already seen H-1 mission capable rates achieve historic highs while flying 23% of the Marine Corps' flight hours at comparatively low cost per flight hour.

A unique aspect of the H-1 upgrade program is 85% commonality of major components between the AH-1Z and the UH-1Y aircraft. While this streamlines logistical sustainment and flight line maintenance, it also poses challenges and risk when components are not as available or as reliable as projected.

Recent H-1 readiness and reliability initiatives such as the Performance Baseline Logistics (PBL) contract, awarded in 2019 and the Defense Logistics Agency (DLA) Captains of Industry (COI) contract, awarded in 2020, have assisted efforts with H-1s reaching the best sustained Mission Capable (MC) rates since 2017. Between 2017 and 2021, AH-1Z readiness increased 6.3 percentage points to 71.9% MC, while UH-1Ys gained 4.1% to a peak of 68.1% MC. Internal data reviews and establishment of the H-1 Program Reliability Control Board have focused on identifying Partial Mission Capable and Full Mission Capable degraders. These recent efforts have improved maintainability, reliability and have increased supply posture.

Additionally in 2020, the H-1 program was established as a pilot program for the Sustainment Program Baseline (SPB). Updated bi-annually, the SPB establishes the performance plan for the platform's sustainment system. Through this baseline, leadership will maintain insight into the status of all key measurements that are necessary to enable required readiness in the H-1 sustainment phase and reflects the Naval Aviation Enterprise's (NAE's) plan to achieve readiness requirements for the H-1 fleet and the risk profile for the future readiness generation.

RESERVE INTEGRATION

The reserve component (RC) consists of two reserve squadrons: HMLA-775/MCAS Camp Pendleton, and HMLA-773/Joint Base McGuire-Dix-Lakehurst with HMLA-773 Det A/NAS New Orleans. As of 2020, the RC has fully transitioned to the UH-1Y and AH-1Z upgrades. The HMLA RC continue to support MARFORs and joint forces by conducting training and frag support, as required.

UH-1/AH-1 (HMLA) PLAN

INITIATIVES AND WAY AHEAD

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

These capability and capacity initiatives will ensure H-1s remain lethal, networked, persistent, and risk worthy. Digitally integrated with the joint force, the H-1 will be a kill web enabler/effector and support distributed lethality. As a networked sensor/shooter, the H-1 provides commanders with options to disrupt, contest, and confront malign behavior.

Additional H-1 improvements may be leveraged through future Foreign Military Sales. Recently the Kingdom of Bahrain and the Czech Republic have purchased Viper and Venom aircraft.

UPGRADES AND IMPROVEMENTS

Digital Interoperability

- LINK-16
- Adaptive Networking Wideband Waveform (ANW2)
- Full Motion Video
- Ethernet Backbone
- SATURN/MUOS

- APR-39(D)V2 retrofit
- JUONS Distributed Aperture Infrared Countermeasures (DAIRCM) and DAIRCM program of record

Structural Improvements (UH) & Electrical Power Upgrades (AH/UH) (SIEPU)

- Intrepid Tiger II
- AH-1Z Joint Air to Ground Missile (JAGM)
- AIM-9X
- Embedded GPS/Inertial Navigation System (EGI) upgrade
- BRITE Star Laser Spot Tracker (UH)
- Target Sight System Laser Spot Tracker (AH)
- Deployable Mission Rehearsal Trainer
- MCAS Futenma simulators
- Helmet improvements
- PRU-70/AE vest replacement
- Wireless ICS
- Drive train/dynamic component improvements
- Rotor Brake Improvements
- Tech Refresh Mission Computer (TRMC) retrofit
- System Configuration Set 8.2

Degraded Visual Environment (DVE) capability



CH-53E AND CH-53K (HMH) PLAN

VALUE TO THE MAGTF

In order to remain lethal and thrive in the modern day battlefield, a commander must maneuver and sustain the force in a contested and distributed environment. The USMC heavy lift community provides today's commander the mobility required to mass combat power anywhere on the battlefield and assists in logistical support by enabling the movement of heavy equipment and supplies required to sustain a Force in an environment where surface connectors are not viable.

The CH-53E "Super Stallion" provides the sustainment of combat operations by allowing continued movement and resupply of personnel and equipment in stride, across the battlefield. This capability will only increase with the introduction of the CH-53K "King Stallion".

The CH-53E entered service in 1981 and is the only heavy lift helicopter in the DoD rotorcraft inventory. The current force of eight active squadrons and one reserve squadron supports heavy lift assault support operations around the

globe. This ship-to-shore vertical connector routinely transports loads in excess of 20,000 pounds, providing the MAGTF and joint force with the ability to conduct distributed operations, rapidly mass combat power, and conduct crisis response operations. The CH-53E remains an indispensable asset to the Fleet Marine Force and integrated naval expeditionary force.

The CH-53K is an optimized vertical, heavy lift, sea-based, long range solution for the naval force and will immediately provide three times the lift capability of the CH-53E. The CH-53K will be the only fully-marinated, heavy-lift helicopter capable of transporting one hundred percent of the vertical MAGTF. It boasts expanded capability to deliver internal and external cargo loads, providing the commander a mobility and sustainment capability the MAGTF has never had before.

MISSION STATEMENT

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

CH-53E AND CH-53K (HMH) PLAN

CAPABILITIES: CH-53E

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

Aircraft Specifications

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

Configuration

- Payload: 30 passengers, 24 litters, (7) 40"x48" pallets
- Armament: (3) GAU-21 .50 cal machine guns
- ASE: DIRCM, AAR-47, ALE-47, APR-39

Mission Profile

- Range/Payload/Conditions: 110nm, 9,628 pound external load, 3000' destination elevation, 91.5°F OAT



A CH-53E Super Stallion helicopter lands aboard *Queen Elizabeth-class* aircraft carrier.

CAPABILITIES: CH-53K

The CH-53K King Stallion is currently in the initial operational test and evaluation phase and will replace the CH-53E Super Stallion starting in FY22. The physical foot print of the CH-53K is equivalent to the CH-53E while its logistical footprint has been significantly reduced. Other improvements include: modern glass cockpit, fly-by-wire flight controls, efficient 4th generation main rotor blades, and an engine which produces 57% more horsepower with 63% fewer parts relative to its predecessor..

The most notable attribute of the King Stallion is its ability to maintain increased performance margins in a degraded aeronautical environment (e.g. High: 3000' / Hot: 91.5°F / Heavy: 27,000 pounds out to 110 NM). This translates to any of the following load configurations: 2 x armored HMMWVs, 2 x ECVs, or a JLTV. With increased combat survivability through an advanced suite of vulnerability reduction features, the CH-53K will serve as a critical enabler in the mission sets required during distributed operations in a contested environment.

Aircraft Specifications

- Empty weight: 43,750 pounds
- Max gross weight: 88,000 pounds
- Useful internal payload: 20,000 pounds
- Useful external payload: 36,000 pounds
- Speed (Cruise/Max): 150kts / 170kts

Configuration

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

Mission Profile

- Range/Payload/Conditions: 110nm, 27,000 pound external load, 3000' destination elevation, 91.5°F OAT

CH-53E FUNDING PRIORITIES

1. Sustain and maintain CH-53E Reset in support of the CH-53K transition plan
2. #2 Engine fire mitigation – increase safety
 - a. Upgraded fire suppression
 - b. New hydraulic disconnects
 - c. Engine compartment sealant
3. Integrated Vehicle Health Monitoring Unit – address combat obsolescence.
4. Digital Interoperability – modernization efforts.
 - a. Mesh Network Manager
 - b. Small Tactical Terminal
 - c. MAGTABs



HMH-366 and the United States Air Force 621st Contingency Response Wing executing the Tactical Recovery of Aircraft and Personnel (TRAP) of a decommissioned CH-46.

CH-53K FUNDING PRIORITIES

1. Aircraft procurement and ramp to support FOC in 2029
2. Complete initial System Design and Demonstration activities – provide initial operational capabilities to the fleet
3. Critical system design improvements and capability expansion
 - a. Helicopter insertion and extraction techniques
 - b. Digital interoperability
4. Establish organic future test and evaluation capability – integration of advancing capabilities
 - a. Operations with independent hook loads
 - b. Software updates
 - c. Helmet Mounted Display



A CH-53K King Stallion conducts an external lift of a LAV-25 (25,200lbs) in the MCAGCC Training Area, Twentynine Palms, CA, at over 8200 feet of density altitude.

CH-53E AND CH-53K (HMH) PLAN

ORGANIZATION

Marine Corps CH-53 squadrons are organized to support the specific requirements of the naval force. 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 CH-53 squadron is capable of sourcing a .5 and two .25 requirements simultaneously. However, inventory shortfalls required the reduction of tactical squadrons to a .75. This temporary base unit is only capable of supporting a .5 and a .25 requirement simultaneously.

Starting in FY23, the CH-53 transition will return the heavy lift community to 16 aircraft per squadron. This will be enabled by the fielding of new CH-53Ks and the recapitalization of CH-53E inventory from transitioning and deactivating squadrons.

In accordance with Force Design 2030, the heavy lift community will support the Marine Corps with:

- 5.25 active squadrons x 16 CH-53
- 1 reserve squadron x 16 CH-53
- 1 fleet replacement squadron x 17 CH-53

The Marine Corps will start the CH-53K transition in FY22. It will take approximately 18-24 months for each HMH squadron to transition. In approximately FY24, the first CH-53K MEU detachment will CHOP in order to deploy in FY25 and set the initial conditions for sustained CH-53K MEUs. The supportability of this deployment is driven by aircraft procurement and execution of the current test and evaluation plan. UDP and its associated MEU will transition to CH-53K in conjunction with the CONUS-sourced MEU and West Coast transition.

HMH TRANSITION PLAN

Unit	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32
VMX-1		2E→6K→2K	New River - Yuma (FY24)										
HX-1				1E→1K	Patuxent River								
HMH-463			12E→0E										
HMH-461			12E→20K	New River									
HMH-366			12E→0E										
HMH-464				16E→0E									
HMHT-302				21E→17K* (Dual Series FRS)	New River								
HMH-361					16E→16K	Miramar							
HMH-462						16E→16K	Miramar						
HMH-466							16E→16K	Miramar					
HMH-465								16E→16K	Miramar				
HMH-772									8E→16K	Joint Base McGuire			

Test SQDN	Active SQDN	FRS SQDN	Reserve SQDN	Deactivated
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Notes:

Each squadron completes transition when able to report C-3 or greater in DRRS signifying deployability

* Actual PAA and structure build at FRS will fluctuate due to transition, dual TMS requirements, pilot/aircrew production, and operational need

The left side of shaded region aligns with the redesignation of the squadron and the ceasing of legacy flight operations.

CH-53E AND CH-53K (HMH) PLAN

SUSTAINMENT

The sustainment strategy will keep the CH-53E viable until the CH-53K fully comes online and the transition is complete. We will continue investing in programs that sustain and maintain the CH-53E while prioritizing efforts that can be transferred from the CH-53E to CH-53K.

The CH-53E program is focused on addressing inventory shortages, readiness degraders, material shortfalls, obsolescent issues, and any emerging safety concerns. We will:

- Continue funding of the Reset program, which produces a 10% higher mission capable rate over non-Reset aircraft.
- Continue support and funding of Performance Based Logistics in effort to enhance supply and parts coverage.
- Continue funding of Program Related Engineering / Logistics (PRE/PRL) to increase support of existing systems while decreasing turnaround time for fleet responsiveness and dispositions.
- Perform a strategic review of every aircraft to identify “best of breed” intended to outfit the fleet during the CH-53K transition, lasting through the deactivation of all CH-53E squadrons.

RESERVE INTEGRATION

In FY23, HMH-772 (-) returns to its full complement of CH-53E aircraft and capable of providing Global Force Management relief for active component squadrons on the West Coast during their execution of the CH-53K transition. While the final location for where HMH-772 will conduct their transition is to be determined, the expectation is that HMH-772 will increase to a 1.0 squadron of CH-53K by FY30 as last squadron to transition from CH-53E to CH-53K.



CH-53E AND CH-53K (HMH) PLAN

INITIATIVES AND WAY AHEAD

The coming years for the heavy lift community are as complex a timeframe as any community has experienced. Over the next three years:

- 1) Three squadrons will deactivate.
- 2) West Coast squadrons will be funded and return to 16 x CH-53E in FY23.
- 2) Two squadrons on the east coast will transition from CH-53E to CH-53K. HMHT-302 will conduct dual series Fleet Replacement Squadron training from FY24 through FY26.
- 3) The VMX-1 CH-53K detachment will move from MCAS New River to MCAS Yuma in FY24.
- 4) CH-53K Initial Operational Capability will be achieved in preparation for the first CH-53K detachment MEU CHOP in FY24 with a follow on deployment scheduled for FY25.
- 5) The West Coast starts the CH-53E to CH-53K transition beginning in early FY25.



RECENT/FUTURE UPGRADES

Multifunctional Control Display Software Upgrades
Integrated Vehicle Health Monitoring Unit

SURVIVABILITY

Advanced Threat Warner/Missile Warner/Laser Warner
APR-39 D(V)2

INTEROPERABILITY

Digital Interoperability "Medium"
MAGTF Agile Networking Gateway Link (MANGL)

SAFETY ENHANCEMENTS

#2 Engine Fire Mitigation and Suppression Efforts
Engine Nacelles
Tail Rotor Disconnect Bearing Monitor Upgrade

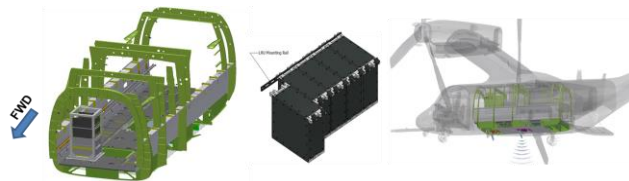


AIRBORNE ELECTROMAGNETIC WARFARE (EW)

VALUE TO THE MAGTF

Marine aviation as part of a larger Electromagnetic Spectrum Operations (EMSO) campaign plan is fielding an EW family of systems (FoS) to provide commanders with organic, flexible, and persistent airborne EW capabilities within the MAGTF. A network of EW payloads that provides advanced electromagnetic attack (EA) and electromagnetic warfare support (ES) capability on existing multi-role MAGTF platforms comprises the Intrepid Tiger II (IT-II) EW FoS.

- IT-II Versions (V) 1 and 3 are currently in service and deployed in support of MAGTF operations on the AV-8B and UH-1Y respectively.

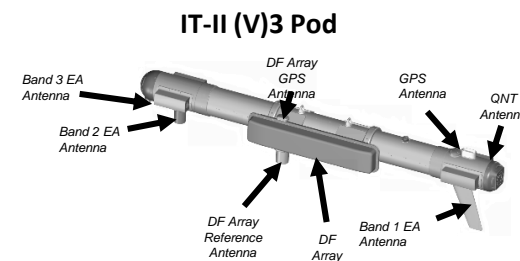


IT-II (V)4 roll-on/roll-off aboard MV-22 B

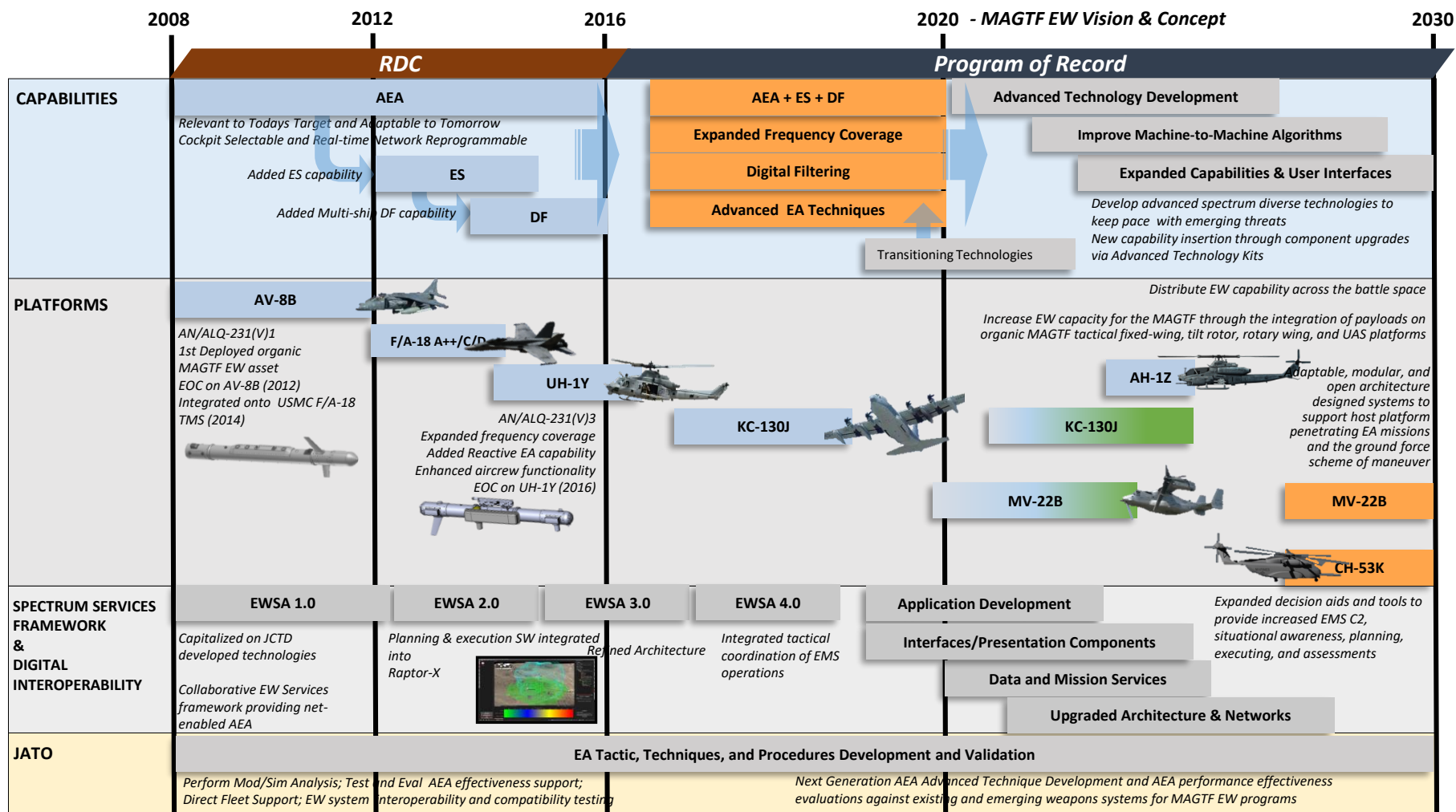
- (V) 1 and (V) 3 focus on Communications EW (Comms EW).
- (V) 4 is currently in operational test on the MV-22B, with an IOC goal of FY23.
- IT-II Block X incorporates Counter-Radar capabilities and is currently under development.
 - Priority platforms are the MV-22 and KC-130. KC-130 IOC goal is FY26.
- The evolving MAGTF Unmanned Expeditionary (MUX) FoS will incorporate a variety of EW payloads in support of the Fleet Marine Force (FMF) and larger joint force.



A U.S. Marine Corps UH-1Y Venom helicopter with IT-II (V)3



AIRBORNE ELECTROMAGNETIC WARFARE



COMMS EA (V)1 & (V)3

RADAR EA (Block X)

OTHER (UAS ES/EA)

INTEROPERABILITY

RDC – Rapid Deployment Capability
 UAS – Unmanned Aerial Systems
 JCTD – Joint Capability Technology Demonstration
 AEA – Airborne Electronic Attack
 ES – Electronic Warfare Support
 EOC – Early Operational Capability

EWSA – Electronic Warfare Services Architecture
 TTNT – Tactical Targeting Network Technology
 CEWCC – Cyber Electronic Warfare Coordination Cell
 DF – Direction Finding
 SSF – Spectrum Services Framework
 JATO – Jammer Techniques Optimization Group

**FUTURE VERTICAL LIFT (FVL) –
VERTICAL TAKE-OFF AND LANDING (VTOL)
FAMILY OF SYSTEMS (FOS)**

VALUE TO THE MAGTF

The whole of the VTOL FoS will provide a suite of material solutions capable of executing across diverse AO's and mission sets, providing the flexibility needed to meet and excel in the fight of 2030 and beyond. VTOL FoS squadrons will be manned, trained, and equipped to operate as a full-strength squadron, or as a squadron (minus) with two sustainable detachments. Scalable and tailorable detachments, based on the needs of the operational commander, perform all mission essential tasks of the full squadron. While the physical characteristics provide flexibility, the open systems architecture will enable modular and rapid capability upgrades that can adapt to the needs of the ground commander in an evolving and changing operational environment. VTOL FoS aircraft can base and operate from a diverse set of sea-bases similar to today's L-Class and E-Class ships and forward expeditionary lodgments found in expeditionary advanced bases. The units can operate from naval shipping in sanctuary while using sea bases for refueling and weapons reloading points or task organize into a detachment that can operate forward within the enemy's weapon engagement zone under direct control of the operational commander. The logistical footprint of personnel and maintenance pack-up is optimized to take advantage of advances in artificial intelligence, predictive maintenance practices, advanced supply chain management and additive manufacturing to sustain maintenance at the lowest level.

**ATTACK UTILITY REPLACEMENT AURCRAFT
(AURA) TRANSITION UNDER FORCE
DESIGN 2030**

In 2016 the Marine Corps and Army collaborated to develop an FVL Capability Set 3 Initial Capability Refinement Document (ICRD) that outlined high level requirements for an attack and utility capability. The FVL Capability Set 3 ICRD formed the basis of the Material Development Decision (MDD) and informed the Capability Set 3 multi-service Analysis of Alternatives (AoA) for an attack and utility replacement in 2035.

USMC Force Design shifted our focus to near-peer competition and introduced an opportunity to assess our vertical lift capability concepts and requirements through a new lens. The Marine Corps is assessing its VTOL Capability Portfolio to meet Force Design 2030 (FD 2030) objectives by assessing the FVL Attack Utility Replacement Aircraft (AURA) and complementary initiatives (MUX, Medium Lift Assault Support, and ULS-A) through a comprehensive, inter-dependent and cooperative perspective under the concept of operation and initial requirements driven by FD 2030. Under a family of systems, both crewed and uncrewed, Marine Corps VTOL aircraft share attributes that can be developed to achieve fiscal savings and economies of force under a cohesive strategy. Force Design 2030 allows opportunity for vertical lift to attack several pressing challenges in survivability, lethality, sustainment and interoperability.

**FUTURE VERTICAL LIFT (FVL) –
VERTICAL TAKE-OFF AND LANDING (VTOL) FAMILY
OF SYSTEMS (FOS)**

FAMILY OF SYSTEMS CONCEPT

The VTOL FoS is a group of capabilities with key attributes (air vehicles, weapons, sensors, airborne networks, and interfaces) that are uniquely designed and configured based on specific mission performance drivers dictated by changing operational environments. The systems are founded on common open systems architectures and designed using digital engineering tools and model based systems engineering principles. As a whole system the VTOL FoS will perform six functions of marine aviation and maritime aviation operations with discrete technological focus areas in **survivability, lethality, communications, autonomy, human cognitive performance, autonomous system teaming, human-system interface design, open-system architectures, and alternative energy applications.**

The Marine Corps will leverage the Joint Future Vertical Lift framework for inter-service synchronization in order to reduce developmental and life cycle costs for new vertical lift air vehicles, subsystems, software, and components. Emerging operating concepts like Distributed Maritime Operations, Littoral Operations in a Contested Environment, and Expeditionary Advanced Based Operations dictate a need for seamless integration with Joint All-Domain Command and Control systems, capabilities for manned-unmanned teaming (MUM-T), increased survivability, increased lethality, greater speed and range, and increased versatility in order to meet the demands of a Stand in Force. The VTOL FoS will meet these demands and offer operational commanders critical capabilities that directly contribute to the mission of defeating adversaries throughout the full spectrum of conflict.

FRAME THE PROBLEM

Through Federally Funded Research and Development Centers, the service is conducting a capability based assessment and develop requirements framework documentation for a VTOL FoS. Focused engagements with joint VTOL partners outside of the traditional industrial base to expand knowledge on emerging concepts. Embarked on automation, autonomy, and teaming theory and technology projection. Initiated survivability, lethality, and interoperability projects via high fidelity MS&A activities. Searched for institutional efficiencies for aviation technology development. Explored alternative acquisition models that are architected to mature technology outside of programs of record.

LESSONS LEARNED

Parallel gap assessment and requirements documentation are necessary to support POM resource appropriations. The commercial electric / hybrid VTOL sector and associated supporting technology is immature but offers transformative opportunities. Air Force High Speed VTOL Challenge is spawning new systems, components, and sustainment technology. The service's understanding of autonomy and teaming applications is nascent with no clear strategy. Aircraft survivability, lethality, and interoperability lead to effectiveness and needs to be viewed in context; technology and new concepts of employment can change the operational paradigm.

**FUTURE VERTICAL LIFT (FVL) –
VERTICAL TAKE-OFF AND LANDING (VTOL) FAMILY
OF SYSTEMS (FOS)**

ASSESSMENTS, ANALYSIS, EXPERIMENTATION

As FLV FoS evolves, Aviation, working with DC CD&I is refining requirements leveraging a series of analytical efforts from across academia and think tanks. The Marine Corps is using an integrated analytical framework, user-centered design thinking, and emergent human-autonomous system teaming design theories to refine concepts, advance technology, evolve organizational culture, and develop the right capability solution. The development plan includes a series of assessments, analytical studies and experimentation to inform requirements development and reduce programmatic risk in key technical focus areas. Highlights from this list of efforts include the following:

The Mission Survivability Tradespace Assessment:

- Red kill chain and threat based survivability analysis.
- Uses accurate threat models to identify operational techniques and technological solutions to enhance platform survivability.

**The Center for Naval Analysis' Rotorcraft
Signature Experiment**

- Experiment to enhance survivability by further developing our understanding of rotary wing signatures.

Project Pegasus

- Evaluates bandwidth constraints, fragilities within a network infrastructure, system resiliency under high demand situations, and explore the impact of advanced communications technology applied to emerging operational concepts.

Georgia Tech Research Institute

- Conduct a human-machine task and function allocation analysis to optimize human workload, situational awareness, reliability, decision timelines.

**Johns Hopkins University - Applied Physics
Laboratory's Tactical Advancement for Next
Generation (TANG)**

- Developing future cockpit prototypes, through a user-centric design process, to identify human machine integration requirements that can adapt to future technologies and emerging missions.

Naval Postgraduate School

- Conducting a research project focused on Coactive Design to identify interdependence relationships of human machine teaming with FVL aircraft.

The accumulations of all the analytics and experimentation will be a fully immersive Living Lab concept that will provide the fleet, engineering, and T&E communities a real-time collaborative space using AR/VR/XR capabilities at remote sites (CONUS and OCONUS). This will enable faster develop and deployment to the end user as well as enabling a consistency in training and mission planning.

The USMC VTOL FoS portfolio will explore emerging VTOL concepts such as: Electric VTOL, Hybrid VTOL and High-Speed VTOL to maintain a competitive edge and keep pace with advances in technology.

Concurrent with these efforts, the VTOL FoS will leverage support from intra-government research laboratories like Naval Research Labs and Defense Advanced Research Projects Agency (DARPA); inter-service synergies with the Army Futures Command, N98 Air Warfare, and AFWERX; and synchronized engagements with industry partners through requests for information and various contract vehicles.

MQ-9A REAPER (VMU) PLAN

VALUE TO THE MAGTF

The Marine Air Ground Task Force Unmanned Aircraft System (UAS) Expeditionary (MUX) Medium Altitude Long Endurance (MALE) will enable future Marine Corps, naval, and joint force operating concepts utilizing Tier 1 operational capabilities: Airborne Early Warning (AEW), airborne communications extension, maritime domain awareness (MDA), and electronic warfare support (ES). Future enhancement of MUX MALE is anticipated, expanding upon the Tier 1 missions, introducing subsequent capabilities (e.g., offensive air support, tactical transportation, etc.), and specifying the MALE's role supporting Distributed Maritime Operations (DMO), Littoral Operations in a Contested Environment (LOCE), and Expeditionary Advanced Base Operations (EABO).

The value of the MUX-MALE to the MAGTF lies in its ability to host a suite of mission systems aboard an MQ-9A Extended Range (ER) Block 5 aircraft. Through these systems, the MUX MALE enhances and extends battlespace awareness for distributed maritime and land-based forces. Onboard sensors augment existing and emerging AEW, MDA, and ES capabilities within the joint

force, sharing information in real-time via multiple networks and information systems. The MQ-9 will support the MAGTF with a podded, airborne communications extension that will serve as a digitally-interoperable network bridge for Marine Corps, naval, and joint assets, allowing distributed units to share information and collaborate via distinct and evolving waveforms. The MALE's modular framework enables the tailoring of solutions to mission-specific requirements, and seamless integration of future capabilities, supporting operations in a fluid and complex environment.

While the MUX MALE's Tier 1 missions (i.e., AEW, airborne communications extension, MDA, ES), position it as an enabler within the larger Marine Corps and Joint Family of Unmanned Aircraft Systems (FoUAS), operational and employment concepts for the UAS will continue to evolve with the assimilation of future systems. With varied and overlapping capabilities, when fully integrated, the FoUAS will provide distinct strategic and tactical advantages to distributed forces, supporting the spectrum of warfighting functions. The MALE will serve as a pivotal link within this FoUAS and between distinct Marine Corps, naval, and joint force assets, maximizing multi-domain, crewed and uncrewed teaming across the battlespace.

MQ-9A REAPER (VMU) PLAN

MISSION STATEMENT

Support the MAGTF commander by providing multi-sensor surveillance and reconnaissance; data gateway and relay capabilities through an aerial layer; and enabling or conducting the detection and engagement of targets during expeditionary, joint, and combined operations.

CAPABILITIES

Endurance: Greater than 20 hours

Cruise Speed: 175 kts

Altitude: 25,000 ft

Max Payload: 3800 lbs

Service Life: 36,000 hrs

Payloads:

Detect and Avoid System (DAAS)

Airborne Network Extension

Automated Identification System

MTS-D EO/IR System

Extended Range Fuel Tank

UPGRADES for 2022-2026

1. Airborne Network Extension
Payload

2. Auto Take-off and Landing

3. Airborne Early Warning Radar

4. EW Support Payload

MQ-9A REAPER (VMU) PLAN

MUX-MALE (MQ-9A Block 5-25 ER)

In October of 2020, the USMC selected the General Atomics MQ-9A to fulfill MUX ICD Tier 1 requirements through a Mid-Tier Acquisition Program. The program of record consists of 18 aircraft and associated equipment with 2 currently fielded and operational MQ-9A Block 5-15 aircraft and 2 Block 30 Ground Control Stations.

The USMC will employ the MQ-9A with a suite of add-on pods to support the Marine Littoral Regiment as the stand-in force. The aircraft will provide Intelligence, Surveillance, Reconnaissance and Targeting (ISR-T) as well as performing additional missions such as: Maritime Domain Awareness (MDA), Airborne Network Extension (ANE), Airborne Early Warning (AEW) and Electronic Support (ES).



U.S. Marine Corps Captain Joshua Brooks, an unmanned aircraft system officer, and Master Sergeant Willie Cheeseboro Jr., an enlisted aircrew coordinator with Marine Unmanned Aerial Vehicle Squadron 1, prepare to launch and operate the first Marine Corps owned MQ-9A Reaper on Marine Corps Air Station Yuma, Ariz. Aug. 30, 2021.

MUX-MALE FUNDING PRIORITIES

1. MQ-9A Acquisition – transition from RQ-21A ISO FD2030 objectives
2. Airborne Network Extension payload fielding and sensor spiral development – MAGTF integration and connectivity
3. Organic Fleet Replacement Squadron and CNAT schoolhouse development – RQ-21 transition
4. Airborne Early Warning and Electronic Warfare capabilities – advanced MAGTF warfighting capabilities
5. MQ-9A spares and Government Furnished Parts – reliability and readiness



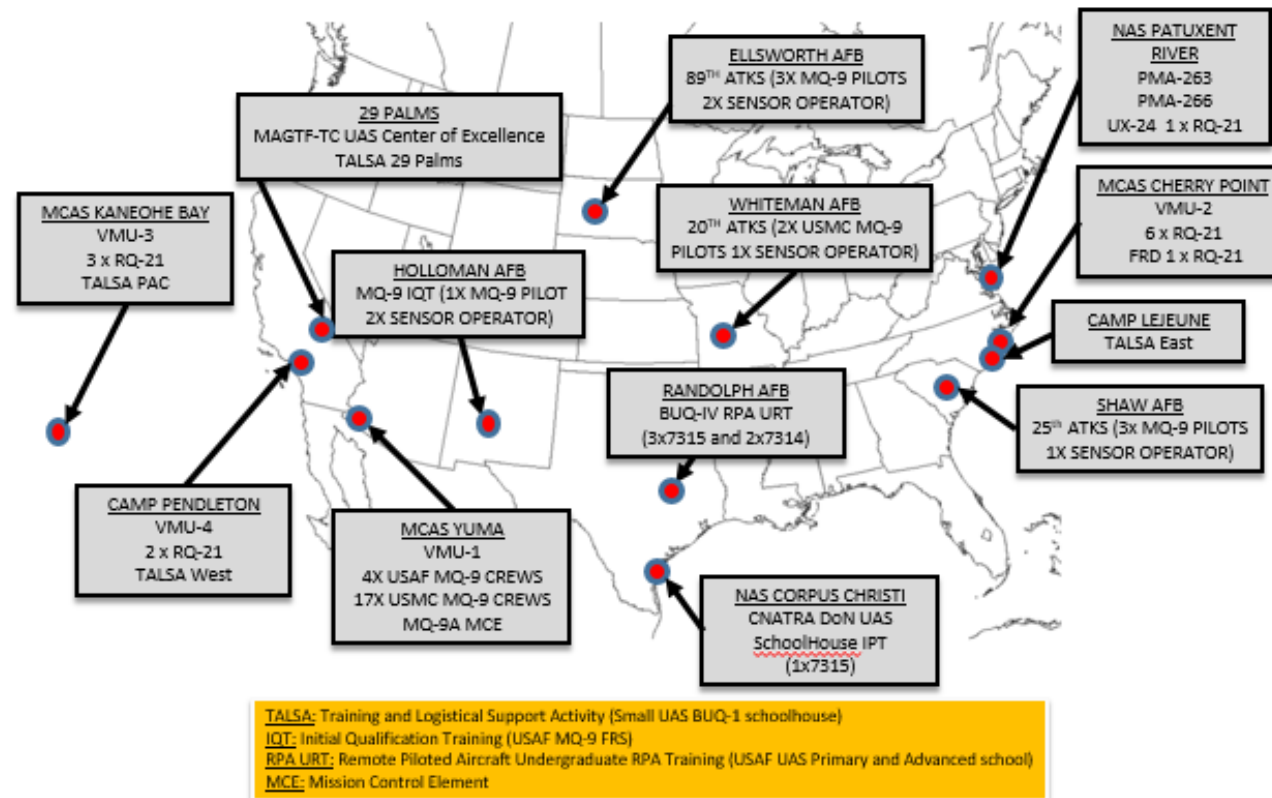
Artist rendering of MQ-9A 5-25 ER with VMU-1 markings

MQ-9A REAPER (VMU) PLAN

ORGANIZATION

The Marine Corps has a current inventory of 2 MQ-9A Block 5-15 aircraft and 2 Block 30 GCS's. The program of record will field a total of 18 aircraft in the block 5-25 variant, with 6 block 30 GCS's.

The USMC fleet will maintain two active squadrons and one training squadron through the end of 2025. Additionally, funding and structure plans are currently being considered to facilitate an additional 3 active VMU squadrons in support of Force Design 2030, thereby doubling the unmanned aircraft capacity of the Marine Corps.



MQ-9A REAPER (VMU) PLAN

Unit	Location	PDM AC	FY22				FY23				FY24				FY25			
			Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Top-Level Schedule																		
VMU-1	MCAS Yuma	(1) x PDM	◇ GCS #1 (Dual)								ICD-705 GCS #5/#6				◇ GCS #5 (Block 30)			
	OCONUS		▲▲ A/C #1/#2 (-15s)								▲ A/C #5/#6 (-20s)				▲ PDM A/C #9			
VMU/T-2	MCAS Cherry Point	(3) x PDM					RQ-21 Divest				▲ PDM A/C #4/#5				▲ PDM A/C #6			
VMU-3 P1: EOC	MCAS Kaneohe Bay	(3) x PDM	RQ-21 Divest				▲▲ GCS #38/#4 (Block 30)				VMU-3 FD IOC SFF				▲ PDM A/C #7/#8 (-25s)			
VMU-4	CPEN		RQ-21 Divest				-DEACTIVATED-											
UX-24 P2: Test	NAS PAX	TBD					▲				◇ GCS #6 (Block 30)							

PoR AvPlan results in 2 operational squadrons with one operational orbit each, capable of conducting homebase flight operations/training support, as well as a Fleet Replacement Squadron + Maintenance Training Unit providing organic MOS production, and finally a Developmental Test Squadron capability supporting payload development to support the four MUX ICD capabilities tied to the MUX MALE requirement

EOC: Early Operational Capability
 IOC: Initial Operational Capability
 FOC: Full Operational Capability
 SFF: Safe for Flight Declaration
 PDM: Program Directive Memorandum
 GCS: Ground Control Station
 A/C: Aircraft

▲ ARES Contract Aircraft
 ▲ PDM Aircraft
 ▲ Aircraft TBD (ARES/PDM/-25/-20)
 ◆ ICD-705 Compliant GCS
 ◆ ARES GCS
 ◆ GCS TBD (ACC/SPO/Contracted)

MQ-9A REAPER (VMU) PLAN

SUSTAINMENT

MQ-9A will utilize a contract logistics support (CLS) contract while simultaneously standing up and maturing a uniformed sustainment model scheduled to begin in FY25. The USMC will align its maintenance and sustainment efforts under the Naval Aviation Enterprise while leveraging best practices from the USAF.

TRAINING

MQ-9A pilot and sensor operator training is currently conducted through the USAF through an Inter-Service Training agreement, producing 26 qualified aircrews per year in FY22 and FY23. Additionally, inter-service exchanges (ISE's) are underway provide USMC crews experience on USAF MQ-9A tactics, techniques and procedures. Those ISE's will later come back to the USMC, receive differences training, and assist in integrating some of the USAF best practices into how we employ MQ-9A's.

The USMC and USN are in the process of establishing a DoN undergraduate UAS training pipeline under Chief of Naval Air Training (CNATRA) that will eventually replace the USAF Remotely Piloted Aircraft School as the

prerequisite training for MQ-9A T/M/S specific training. The DoN UAS training pipeline is currently expected to begin accepting USMC students circa FY24.

The USMC is in the process of establishing an MQ-9 FRS to replace the platform-specific MQ-9 training currently provided by the Air Force under the ITRO. The FRS will begin accepting students at FY24.

MANPOWER

VMU structure is transitioning from RQ-21A to MQ-9A models and will continue to be refined based on operational demand. The MQ-9A pilot MOS of 7318 replaced the RQ-21A operator MOS of 7315, and efforts to grow and retain personnel continue, such as Aeronautically Designated Personnel (ADP) status which authorizes Aviation Incentive Pay (AVIP) and Bonuses, as required.

7314 and 7318 MOSs are in increasing demand as the service integrates and expands unmanned aviation technology at the operational level. FAC tour assignments, inter-service exchange tours with USAF and key staff positions at all levels from within both fleet and support commands shows the demand and flexibility of UAS professionals.



Block 30 Ground Control Station

RQ-21A BLACKJACK (VMU) PLAN

RQ-21A BLACKJACK

In February of 2021, the Marine Corps made the decision to divest from the RQ-21A program. All USMC VMU's have begun the transition from RQ-21A to MQ-9A and the service will be completely divested by FY 24.

The RQ-21A system is a Group 3 UAS that uses a rail-launched Sky Hook Recovery System (SRS) to launch and recover its aircraft. Each system consists of five aircraft, one launcher, one SRS, 2 Integrated Trailer-ECU-Generators (ITEG), associated support equipment and 4 HMMVS. The RQ-21A is the USMC Group 3 program of record and primarily supports the MEU as well as major service exercises (ITX, WTI). The RQ-21A program reached full operational capability in CY20. Program of record is 21 systems.

To date, the RQ-21 has flown over 21,000 hours, much of which has been in support of deployed forces on the MEU or

JSOTF in support of named operations over Libya, Afghanistan and Northern Iraq. Most recently, the 24th MEU RQ-21 det completed the first operational ship to shore movement in program history in order to support JTF-CR out of Hamid Karzai International Airport. Operating ashore, the detachment flew 183 hours in support of the Afghanistan Evacuation. These operations provide FMV input to the MAGTF MCISRE as well as TTP generation of cross-cueing and cross domain solutions to enhanced software solutions to process, exploit and dissemination (PED) and targeting such as Maven/Minotaur via the TIPSv5.

Combat radius Greater than 50 nautical miles

Extended operational range: 50-100 nautical mile (employing a hub and spoke operational concept)

Payload :
EO/IR/IRMarker/Laser range finder
Twenty-five pound useful load (fuel and payload)



**ADVERSARY AIRCRAFT
F-5 TIGER II (VMFT) PLAN**

VALUE TO THE MAGTF

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

MISSION STATEMENT

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

CAPABILITIES

Aircraft Specifications

- Empty Weight: 9,600 pounds
- Max Gross Weight: 24,675 pounds
- Useful Payload: 5,700 pounds
- Speed (Cruise/Max): 0.8M – 0.98M / MACH 1.63

Configuration

- Weapons Stations: Seven
- Armament Air-to-Air: CATM AIM-9M
- Sensors: APQ-159 RADAR, REDNET



U.S. Marine Corps Reserve F-5N fighters assigned to Marine Fighter Training Squadron 401 (VMFT-401), 4th Marine Aircraft Wing, part of the air combat adversary squadron at Marine Corps Air Station Yuma, Arizona.

ADVERSARY AIRCRAFT F-5 FUNDING PRIORITIES

1. Swiss F-5 recapitalization – reliability and maintainability
2. Airframe upgrades – enhanced aggressor capability and safety with synthetic ability to replicate near-peer adversaries
 - a. Cockpit upgrade
 - b. TCTS II / REDNET 2.0
 - c.IRST
 - d. RADAR



ADVERSARY AIRCRAFT F-5 TIGER II (VMFT) PLAN

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 31 F-5s. The Marine Corps has bought eleven more aircraft; the first will be delivered in Q4 FY23, while the remaining aircraft will be spread over the following four years.

Serving as a training asset for the entire MAGTF, as well as the joint force, the F-5 has seen adversary requirements grow significantly over the past thirteen years. As the Marine Corps continues its transition to the F-35, VMFAT-501 and VMFAT-502 pilot training requirements (PTR) will grow to nearly 1800 required adversary sorties by FY24.

Annual fleet adversary requirements are expected to also increase for transitioning squadrons from 12,000 air-to-air sorties in FY22 to 17,000 sorties per year in order to meet T2.0 requirements in FY25.

SUSTAINMENT

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

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 nearly 15,000 sorties in 2022. Accordingly, the USMC suffers over an **11,000-sortie capacity gap**. Aviation is looking at options to close this gap.

RESERVE INTEGRATION

The VMFT mission resides under 4th MAW, MARFORRES. Reservists make up the majority of a VMFT table of organization. There is a current and growing need for more Active Reserve TACAIR pilots. In addition to accomplishing the adversary mission, VMFT pilots maintain a TACAIR ready reserve that can be brought back to their original platforms with substantial proficiency. There are current efforts to prioritize AR and SMCR pilots in flying billets to maintain a ready reserve of pilots and align with CMC's Talent Management.

VMFT TRANSITION PLAN

Unit	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32
VMFT-401	11N/1F → 11N+/1F+								Yuma				
VMFT-402					3N+ → 8N+ / 2F+				Beaufort				

Test SQDN

Active SQDN

Reserve SQDN

Deactivated

Notes:

N / F designation identifies current TMS configuration, + identifies cockpit upgrade modification

- The left side aligns with initial personnel and aircraft deliverables
- The right side aligns with the squadron achieving its safe-for-flight

**ADVERSARY AIRCRAFT
F-5 TIGER II (VMFT) PLAN**

INITIATIVES AND WAY AHEAD

F-5 is currently undergoing an upgrade to glass cockpits, beginning in FY22, at a rate of 2-3 aircraft per year. Further advancements in Red Net and the integration of TCTS II will allow synthetic adversary injects to decrease the forecasted gap in adversary training. Upgrading EA capabilities and incorporation of an IRST in the future is also a priority within the adversary community and Program Office.

Expansion of the F-5 program will ensure the future success of our training continuum. The Marine Corps has purchased 11 additional F-5s that will enhance the number of adversary aircraft within the Marine Corps. An HQMC Aviation initiative is to use these aircraft to activate VMFT-402 in MCAS

Beaufort providing an east coast adversary squadron.

Commercial Air Services cannot satisfy all of the adversary requirements. The future lies in multiple solutions that include using the fleet of F-5s efficiently, exploring low cost training opportunities, incorporating Live, Virtual, Constructive (LVC) capability, and commercial air services to augment requirements.



OPERATIONAL SUPPORT AIRLIFT (OSA) PLAN

VALUE TO THE MAGTF

OSA remains a critical enabler for forward deployed MAGTF success and has been continuously deployed since 2004. Today, we are supporting MARCENT and MARFOREU/AF. Our program's top priority is to recapitalize all non-deployable UC-12W aircraft in order to continue to meet the MAGTF's wartime requirements. We have eight aircraft, with one aircraft funded in FY20, and still require an additional three aircraft to complete the current program of record.

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. OSA directly 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 logistical 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 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.

MROC DM 57-2010 approved the Marine Corps Operational Support Airlift Master Plan. This plan provides the MAGTF commander with the right mix of aircraft to provide the time sensitive movement of personnel and cargo. The OSA Master Plan articulates OSA aircraft recapitalization to modernize the fleet to meet current and future needs. 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.



UC-35D Transport Aircraft



C-20G Transport Aircraft



UC-12W Transport Aircraft

OPERATIONAL SUPPORT AIRLIFT (OSA) PLAN

CAPABILITIES

UC-35D (10)

Combat range: 1,970 nm
Max gross weight: 16,830 pounds
Payload: 7 passengers
Cruise Speed: 420 KTAS

UC-12F (4), UC-12M (2) and UC-12W (8)

Combat range: 1,974 nm (F/M)
2,345 nm (W)
Max gross weight: 12,500 pounds (F/M)
16,500 pounds (W)
Payload: 9 passengers
Cruise speed: 294 KTAS (F/M)
334 KTAS (W)

C-20G (2)

Combat Range: 4,220 nm
Max Gross Weight: 73,200 pounds
Payload: 14-19 passengers
Cruise Speed: 460 KTAS

C-40A (2) (Delivery set for Dec 2022 and Feb 2023)

Combat Range: 3,200 nm
Max Gross Weight: 171,000 pounds
Payload: 135 passengers
Combi: Passengers and Cargo
Cruise Speed: 534 KTAS



OPERATIONAL SUPPORT AIRCRAFT FUNDING PRIORITIES

1. Complete UC-12W program of record – critical enabler for forward deployed MAGTF
2. UC-12W enhancements and common configuration – critical enabler for forward deployed MAGTF
3. C-40A enhancements (Mode 5 IFF, Enhanced Flight Vision System, Static Random Access Memory) – Navy Unique Fleet Essential Airlift
4. C-20G replacement – critical enabler for the INDO/PACOM AOR



OPERATIONAL SUPPORT AIRLIFT (OSA) PLAN

ORGANIZATION

The Marine Corps has a current inventory of 27 operational support aircraft. The USMC fleet will maintain nine active locations (base/station) and three reserve locations (base/station). Pilots flying OSA do not come in the Marine Corps as an OSA pilot. Because we don't have OSA squadrons, this is a secondary MOS for them. The pilots are sent to the bases and stations (I&L) to man the air stations and fly OSA as a "B" billet.

SUSTAINMENT

Cost of sustaining UC-35s is increasing and the USMC is looking to replace the UC-35 fleet with UC-12W. This will require an increase to the program of record of UC-12Ws to 28. Divestment of UC-35s will be based on the procurement and delivery of the UC-12Ws.

RESERVE INTEGRATION

The Commandant of the Marine Corps requested 4th MAW play a more-pivotal role as a force provider. "Reserves no longer need to be looked at as 'break glass in case of emergency'. With the flexibility and experience base existent within 4th MAW, we need to utilize reserve OSA year-round for our deployed detachments." Operational requirements have had (1) UC-12W and (1) UC-35D deployed in support of MAGTFs in MARCENT and EU/AF areas of operations since 2004. Currently alternating between

the active and reserve components every six months. Following the CMC guidance we will look to shift this to an all reserve deployments supported by the active component.

Reserve component are set to receive (2) C-40A aircraft in FY22 (Dec and Feb).

INITIATIVES AND WAY AHEAD

The OSA program is focused on inventory management while maintaining "a shadow" on every flight line. With a limited number of assets, it is difficult to maintain at least one aircraft on the flight line at all times. While the current UC-35 platform is aging, we are looking for efficiencies. USMC is going to take advantage of the lower cost for sustainment of the UC-12W fleet and start replacing all the UC-35s with UC-12Ws. Current program of record (PoR) for UC-12 is (12) and UC-35 is (12) with no excess for modifications and depots. Going to increase the total PoR to 28. This will allow for less aircraft transfers and more stability.

Recently the Marine Corps has:

- Procured (1) UC-12W (Delivery set for Dec 2021)
- Procured (2) C-40A (Deliveries set for Dec 2022 and Feb 2023)

OPERATIONAL SUPPORT AIRLIFT TRANSITION PLAN

Unit	FY20	FY21	FY22	FY23	FY24	FY25	FY26	FY27	FY28	FY29	FY30	FY31	FY32
MCAS Futenma	(2) UC-12W												
VMR Belle Chasse	(2) UC-12W												
MCAS Iwakuni	(2) UC-12W												
MCAS New River	(2) UC-12W												
NAS Ft. Worth JRB	(2) C-40A												
MCAS Beaufort	(2) UC-12M → (2) UC-12W												
MCAS Camp Pendleton	(1) UC-12W → (2) UC-12W												
MCAS Yuma	(2) UC-12F → (2) UC-12W												
MCAS Miramar	(2) UC-35D → (2) UC-12W												
MCAS Futenma	(2) UC-35D → (2) UC-12W												
VMR Andrews	(3) UC-35D → (3) UC-12W												
MCAS Cherry Point	(3) UC-35D → (3) UC-12W												
VMR Belle Chasse	(2) UC-12F → (2) UC-12W												
MCAS K-Bay	(2) C-20G → (2) C-40A												



Notes:
 (2) C-40A will deliver in Dec 2022 and Feb 2023
 UCMC began the transition from UC-35s to UC-12W in May of 2021

MARINE HELICOPTER SQUADRON ONE (HMX-1)

VH-3D/VH-60N

HMX-1's missions include worldwide transportation for the President of the United States, transportation within the National Capital Region for the Vice President of the United States, members of the President's cabinet, and visiting heads of state. HMX-1 provides support for the Commanding General, Marine Corps Combat Development Command, and continues to conduct operational test and evaluation for rotary wing presidential lift aircraft.

The VH-3D/VH-60N have consistently and reliably supported the office of the President of the United States for decades. Deployed worldwide at a moment's notice, these aircraft provide a vital service ensuring the safe and timely travel of each President, his family, Cabinet officials, and visiting foreign heads of state.

VH-3D/VH-60N SERVICE LIFE EXTENSION PROGRAM (SLEP): The VH-3D/VH-60N underwent a Service Life Extension Program (SLEP) beginning in FY15, which will extend the service life by 4,000 flight hours (each airframe). This SLEP is part of the necessary sustainment plan to maintain these aircraft until their scheduled replacement beginning in FY22.

Both aircraft have been through SLEP and received upgrades and sustainment modifications. Some of the upgrades and modifications included weight reduction efforts and communications upgrades which were vital to ensure mission effectiveness during the upcoming transition period to the VH-92A.



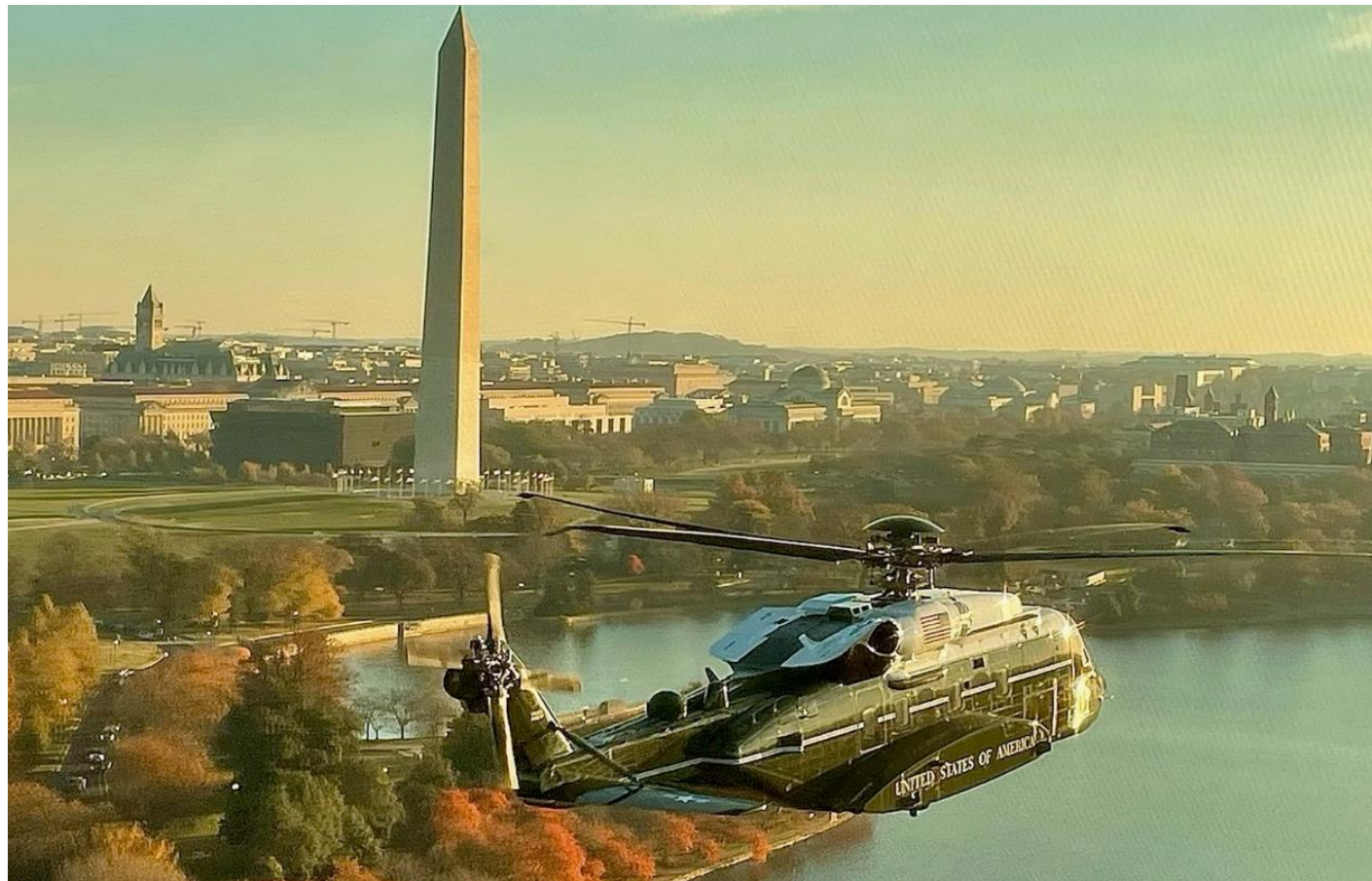
MARINE HELICOPTER SQUADRON ONE (HMX-1)

VH-92A

HMX-1 is currently entering the execution phase of their Presidential Helicopters Replacement Program. The VH-92A will replace both the VH-3D and VH-60N aircraft. The program entered the JCIDS process in FY09 and shortly after Milestone B, during 2nd Qtr FY14, the Sikorsky S-92 was selected and designated the VH-92A. In FY20 HMX-1 received the last SDTA aircraft, for a total of four (4), which supported an IOT&E period that was completed in May 2021.

The program is currently in production, and all three Low Rate Initial Production (LRIP) lots have been awarded for a total of 17 aircraft that are in various stages of production. The steady deliveries of LRIP Lots through 2023 will be coupled with commensurate retirement of in-service assets beginning with the VH-60N.

The introduction of the VH-92A into HMX-1 operational missions will begin in 2022 after conducting White House commissioning events.



MARINE AVIATION WEAPONS AND MUNITIONS PLAN

AIR-TO-GROUND WEAPONS

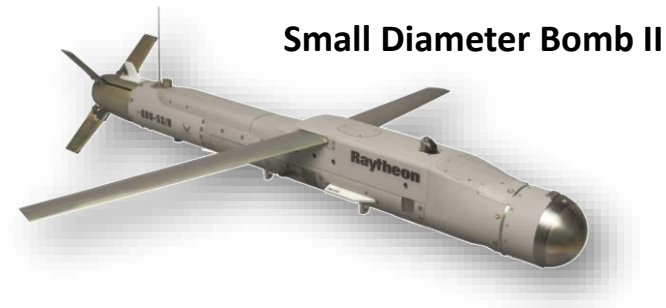
Marine Aviation is developing, integrating, and fielding new weapons capabilities to keep pace with evolving threats and defeat adversary defensive systems in the future fight. As Force Design tailors the complement of advanced fighter and attack aircraft to meet the challenges of global employment, new munitions with increased range, speed, and lethality are being integrated to provide offensive dominance in the air and surface domains.

Priority efforts in the last year have focused on the integration of Net Enabled Weapons on the F-35B/C, long range maritime strike capability, and improved rotary wing strike munitions. Key milestones include: completion of Knowledge Point 4 and entry into low-rate initial production for the Advanced Anti-Radiation Guided Missile-Extended Range (AARGM-ER); successful completion of F-35 safe separation testing for GBU-53 Small Diameter Bomb (SDB) II; completed AH-1Z Operational Test (OT) for the Joint Air-to-Ground Missile (JAGM); integration of AGM-154 Joint Stand-Off Weapon (JSOW) on AV-8B, and inclusion of the AGM-158C, Long Range Anti-Ship Missile (LRASM), on the F-35B/C roadmap.



LONG RANGE & MARITIME STRIKE

The AGM-158C LRASM is a long range, precision guided, anti-ship cruise missile. It provides increased stand-off for semi-autonomous engagement of maritime targets. In 2021, LRASM was included in the F-35 weapons integration roadmap and is planned for Marine Aviation on the F-35B/C. The inclusion of LRASM in Marine Aviation will increase strategic capability in the maritime environment.



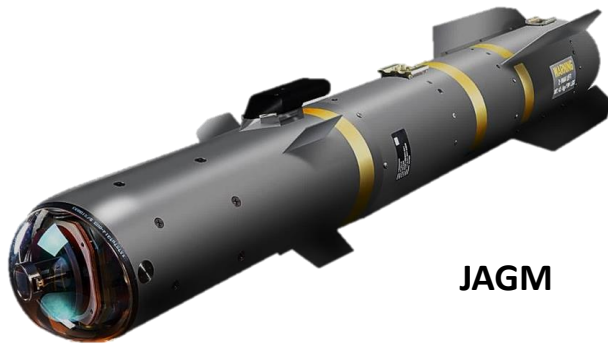
STAND-OFF AND NET ENABLED WEAPONS

Advanced Anti-Radiation Guided Missile-Extended Range (AARGM-ER) improves the baseline AARGM Block I by incorporating a new motor and additional technological advancements, resulting in increased range and missile survivability. AARGM-ER procurement for Marine Aviation begins in FY22 for integration on the F-35B/C.

GBU-53 Small Diameter Bomb (SDB) II is a 250-pound class, net-enabled, precision-guided, gliding munition with a tri-mode seeker that uses semi-active laser, millimeter wave, and imaging infrared. SDB II can be employed against stationary or moving targets in day, night, and all-weather conditions. Both F-35B and F-35C will have the ability to internally carry eight SDB II. SDB II is projected to achieve EOC on F-35B in FY22.

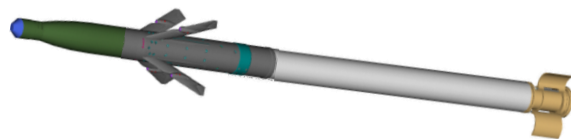
MARINE AVIATION WEAPONS AND MUNITIONS PLAN

ROTARY WING STRIKE WEAPONS



JAGM

The Joint Air-to-Ground Missile (JAGM) program began operational testing on the AH-1Z and is planned to IOC in FY22. It incorporates a dual-mode, semi-active laser and millimeter wave seeker with a multi-mode fuze (height of burst, delay, and point detonating). JAGM's multi-purpose warhead provides capabilities of the AGM-114K/M/N warheads and produces highly effective blast-fragmentation. JAGM improves survivability through an increased launch acceptability region and countermeasure resistance. Additionally, the millimeter wave seeker may be activated pre-launch, providing a fire-and-forget capability with high probability of hit in adverse weather and maritime environments.



APKWS II

Advanced Precision Kill Weapon System II was integrated on the F/A-18C/D in early 2018 and subsequently deployed in support of Operation INHERENT RESOLVE. APKWS II is now on every platform capable of carrying 2.75" rockets and continues to prove its distinct advantage over unguided rockets. The development of a Single Software Variant (SSV), which can be employed from both fixed wing and rotary wing platforms, was completed in FY21 and will field in FY22. The SSV provides increased range and accuracy from low altitudes and high altitude capability for a common weapon between platforms.

New weapons requirements for rotary-wing strike are emerging in response to pacing threats and theater considerations; specifically, a long range kinetic strike capability for low altitude delivery from current and future vertical lift platforms. A new initiative will shape these requirements and lead to the next generation of rotary wing strike weapons that will increase standoff and lethality with modular payloads to achieve desired effects.



MARINE AVIATION WEAPONS AND MUNITIONS PLAN

AIR-TO-AIR MISSILES

The Marine Corps' current inventory of air-to-air missiles continues to evolve. The AIM-9X Sidewinder Block II+ configuration received Interim Flight Clearance (IFC) on the F-35B/C in summer 2021. System Improvement Plans (SIP) III and IV provide multiple hardware upgrades, including a redesigned Inertial Measurement Unit (IMU) which will improve reliability by replacing degraded components.

The AIM-120 Advanced Medium Range Air to Air Missile (AMRAAM) modernization efforts incorporate a Form, Fit, Function Refresh (F3R) that seeks to introduce updated technology and improved performance into AIM-120D3. The Department of the Navy (DoN) has programmed resources for additional Captive Air Training Missiles, to improve training capacity for the Fleet, and to procure significant quantities of AIM-120D3 in the coming years.

AIM-120D



TRAINING

The annual ordnance expenditures for training continue to be a priority effort for HQMC. Training & Readiness (T&R) requirements and Weapons School classes account for a significant ordnance requirement needed to develop and maintain proficiency throughout the fleet. HQMC works to ensure sufficient allocations are provided, while maintaining required inventory levels. As new capabilities come online, training will evolve to generate the readiness required and sustain a ready force.

FUTURE WEAPON SYSTEMS

Marine aviation, in connection with the Marine Corps Warfighting Laboratory (MCWL) and Combat Development & Integration (CD&I) is working to develop emerging technologies that will increase lethality in 2030 and beyond. The Cunningham Group, within HQMC Aviation, is exploring the realm of the possible within both near-term and long-term timeframes in order to defeat the most advanced threat systems. Range, speed, and lethality will be focused efforts in weapons development with consideration for platform integration, operator interface, sustainment, and life-cycle management. Network-enabled weapons, capable of operating over the horizon, will extend the reach of the stand-in force and join the collaborative effort of air and surface-launched munitions to maximize effects on target.

MAGTF DIGITAL INTEROPERABILITY

VALUE TO THE MAGTF

The future MAGTF is increasingly characterized by its ability to sense, share, and fuse information at tactically relevant speeds with the Joint Force, as well as partners and allies. Information, and the speed at which it can be shared, is a driving force in the MAGTF's ability to create tempo in a future operating environment. MAGTF DI aims to develop and field capabilities within a multi-platform aerial layer in order to connect ground-based maneuver units, the space layer, and higher echelons through redundant access points into the Naval Tactical Grid (NTG) and the Joint All Domain Command and Control (JADC2) networks. By developing modular capabilities that are independent of the platform host, MAGTF DI is leveraging investments for the benefit of the entire MAGTF.

The goal of MAGTF DI is to provide the required information to the right participants at the right time, to overcome an adversary, while improving efficiency and effectiveness. MAGTF DI aims to provide greater situational awareness, accelerate the kill chain, and enhance survivability to outmaneuver and defeat the threat.

MAGTF Agile Network Gateway Link (MANGL) "hubs" and "spokes" will form the foundation of interoperability. Hubs have a comprehensive gateway and spectrum agile radio to handle the message translation and network management of present and future tactical data links (TDL). Spokes have the same interfaces, but less capable gateways and legacy radios. The combination of the two leverages past investments while also implementing a threat-informed ecosystem that

can pace future technological developments in iterations and institutional decisions with minimal cost in time and resources to scale. Most importantly, MANGL hubs were never designed to be embedded exclusively in aviation platforms.

BRIDGING THE ENTERPRISE TO THE TACTICAL EDGE

Commercial broadband networks are built on the foundation of billion dollar infrastructure investments and supported by security architectures developed for that specific environment. Adapting that same commercial technology and applying it to the tactical edge environment, which lacks the same infrastructure or standardized security architecture, is doomed to fail without deliberate integration efforts. The Marine Corps has been working closely with OSD and NSA to develop applicable capability packages that will enable standardization of security implementation for commercial technology in the tactical edge environment and leveraging our existing tactical data links. Those efforts are underway this year and are scheduled to begin delivery in late summer 2022.

THE FOUR PILLARS OF DIGITAL INTEROPERABILITY; SENSORS, PROCESSORS, INTERFACES, AND RADIOS/APERTURES

To consistently evaluate technologies and put their utility in perspective with the larger operational context, we use "the four pillars of digital interoperability." A platform must possess and integrate the following four components (pillars) to reliably exchange tactically relevant information from the enterprise to the tactical edge:

MAGTF DIGITAL INTEROPERABILITY

FUTURE DI EFFORTS

MANGL is one of the service's capabilities to connect to the Naval Tactical Grid and Joint All Domain Command and Control (JADC2).

The future Naval Tactical Grid will depend on the Minotaur Family of Systems (FOS) as the underlying technology to fuse disparate sensors and TDIs. MANGL will integrate into the Minotaur FOS within the FYDP. By combining a powerful fusion program like Minotaur with common aircraft survivability sensors, processors like the MNM and radios like SRP, Marine Aviation platforms will contribute a multispectral view of the future operating environment and provide significant value to the Naval Tactical Grid.

COGNITIVE RADIOS AND APERTURES

With radios like SRP that can host nearly any current or future waveform, Marine Aviation is well poised to pace the

next threat. To truly build communications systems that interact with spectrum, Marine Aviation will need to extend the modular approach of SRP, MNM, and MAGTAB, out to the apertures. By leveraging antenna that can be installed on multiple platforms and broadcast or receive across large swaths of the EMS, the incredibly agile SRP can begin to sense and maneuver within the spectrum, effectively employing an auto PACE plan.

Even farther on the horizon, Marine Aviation is pursuing the potential to use SRP for spectrum operations beyond communications. The converging worlds of cyber, communications, and EW are ripe for new concepts of operation and the ACE's forward operations make them ideal platforms in the competition phase.

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 FY24, every Marine Corps aviation platform will have a way to transmit and receive multiple standardized links to meet IERs across all MAGTF mission threads.



MAGTF DIGITAL INTEROPERABILITY

EACH INTEROPERABLE PLATFORM MUST HAVE:

SENSORS



*Wired or
Wireless*

Radars
EO/IR (FMV)
iASE
SIGINT
GMTI
Hyperspectral
RFID
Targeting PLI

PROCESSORS



*Wired or
Wireless*

Mission Computers
C2 Systems
Data Managers
Network Managers

INTERFACES



*Wired or
Wireless*

Cockpit Displays
MAGTAB/Tablets
Computer Monitors
C2 System Displays
Electronic Kneeboard (EKB)
ToughBook Laptops

NETWORK RADIOS

*Usually designed for specific environment:
air-to-air, air-to-ground, ground-to-ground*

●●● **NETWORK A** ●●●

<u>Radios/Terminals</u>	<u>Waveforms</u>	<u>Data Protocols</u>
MIDS-J/STT/PRC-160	Link-16	J-Series
PRC-117G	ANW2	TCP/IP
QNT-200D	TTNT	TCP/IP
VORTEX/Rover	CDL	FMV
PRC-117F/AVT	ANW2	VMF/K-Series

**Note: Platforms may have multiple Sensors, Interfaces,
Processors and support multiple Networks**

MAGTF DIGITAL INTEROPERABILITY

TODAY'S DI ACCOMPLISHMENT

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 the spectrum, and encrypted wireless tablets in the hands of the operator. In 2019 The SPMAGTF Enroute C4 UUNS, codified by the MROC, put permanently installed MNM gateways in 30 fleet MV-22B. With that capability, forward-deployed MV-22Bs can translate Link 16 J-Series messages to CoT, send HPW mission updates to the CoC in the rear, receive

FMV while in flight, and coordinate changes to the ground scheme of maneuver for the benefit of the aircrew and their embarked GCE.

MAGTAB

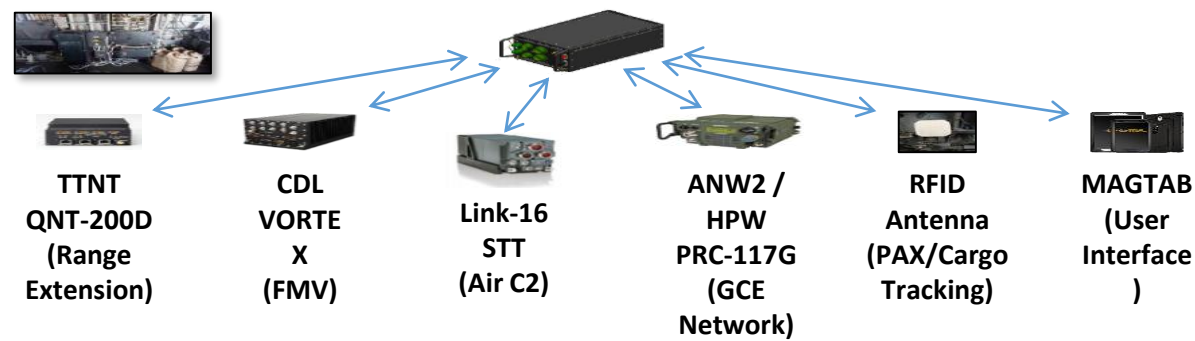
Marine Air Ground Tablet is the end-user device that provides Marines a way to interact with multiple TDLs, in a cyber-secure manner, through school-house standardized applications. With MAGTAB, Marines from any element can collaboratively plan, brief, execute, dynamically re-plan, and debrief on a single platform. Originally designed to meet Marine Aviation's requirements for an Electronic Kneeboard (EKB), other elements of the MAGTF have since embraced it as a dismounted situational awareness tool. As of 2021, more than 5000

"MAGTABs as EKB" were fielded to the ACE, nearly enough for every active-duty aviator and aircrew. Multiple TECOM and support establishment commands have since procured their kits, raising the number of fielded devices to more than 7000.

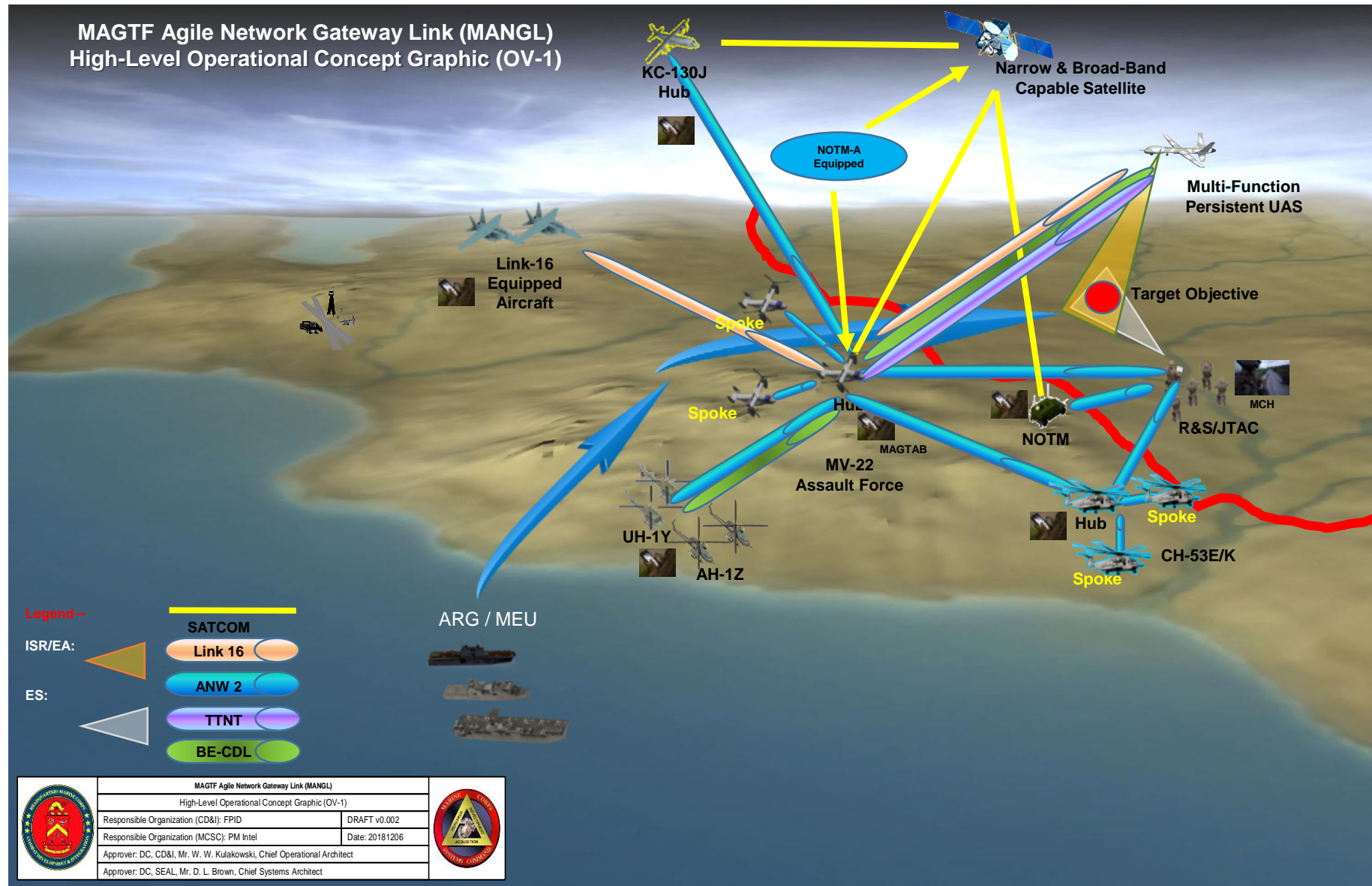
MANGL Spokes

MAGTF aircraft (AH-1Z, UH-1Y, CH-53E, MV-22B, KC-130J) are employing a combination of ANW2 radios, Encrypted Wireless Links (EWL) and MAGTABs to communicate between air and ground maneuver elements. These devices combine to make flight-cleared packages that enable an airborne tactical network as well as communication with similar systems on the ground.

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



MAGTF DIGITAL INTEROPERABILITY



MAGTF DIGITAL INTEROPERABILITY

TODAY'S DI ACCOMPLISHMENT

MEU DI Kit

Since 2015, every MEU and SPMAGTF command element has had a complement of DI kits consisting of MAGTABs and MANGL Spoke kits. Each CE allocates the equipment according to the commander's priorities, and with the recent fielding of "MAGTAB as EKB" even more capabilities are available to the remaining portions of the MAGTF.

DI-FMV 1.0

To meet the AH-1Z and UH-1Y's requirement to transmit and receive full-motion video (FMV), the program office implemented Vortex radios for FMV, PRC-117G, and PRC-152A for ANW2 network connectivity, and Encrypted Wireless Links (EWLs) to fuse all of them into a local wireless

network aboard the aircraft for an enhanced situational awareness interface to the aircrew using MAGTABs. H-1 aircrew operationally employed this system in a recent mission where they identified and transmitted potential targets to the Combat Information Center aboard a naval platform.

SKYTOWER

To provide a persistent and robust communications node, the SPMAGTF Enroute C4 UUNS has been repackaged to fit in an MQ-9 mounted pod. With SKYTOWER enabled MQ-9's, Marines at the tactical edge will receive J series messages on their ANW2 radios and MAGTABs without having to carry Link 16 radios. SKYTOWER will provide maneuver units access to multiple TDLs (TTNT, Link 16, ANW2, and CDL).



MAGTF DIGITAL INTEROPERABILITY

TOMORROW'S DI EFFORTS

MAGTF AGILE NETWORK GATEWAY LINK (MANGL)
The SPMAGTF Enroute C4 UUNS is the Initial Capabilities Document (ICD) for MANGL. The Capabilities Development Document (CDD) for MANGL was approved in Aug 2021, and leverages lessons learned over the last ten years by HQMC aviation and MCCDC. NAVAIR's Common Avionics (PMA-209) assumed responsibility for fielding MANGL in FY21 and absorbed a number of DI efforts under a single program of record.

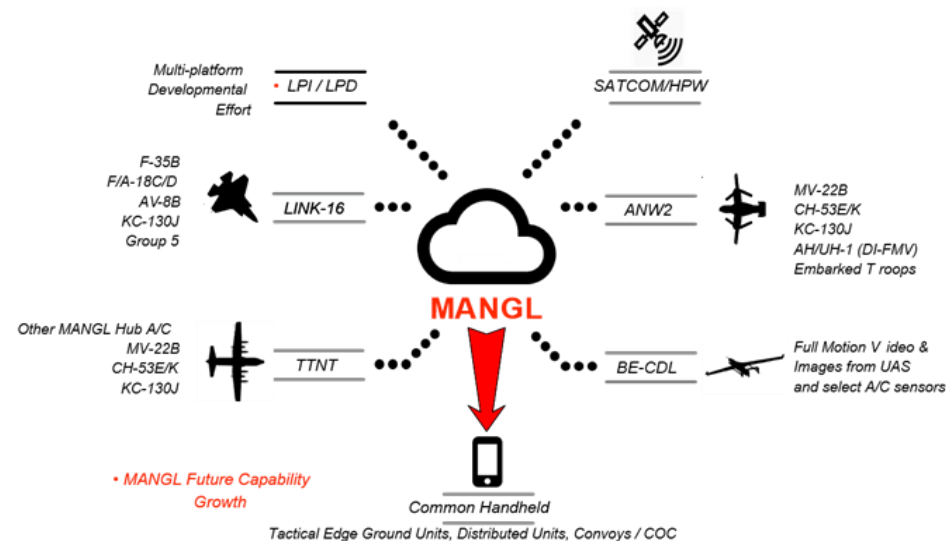
The MANGL CDD builds on the capabilities fielded with the SPMAGTF Enroute C4 UUNS and clearly articulates the desired characteristics of the MANGL system. It will be installed on MV-22, CH-53, KC-130, and future UAS. MV-22 is the lead platform with fielding beginning in FY23.

MANGL is composed of three technologies, the Software Reprogrammable Payload (SRP AN/ARC-254C), the Mesh Network Manager (MNM AN/ASC-43V) Gateway, and the Marine Air Ground Tablet

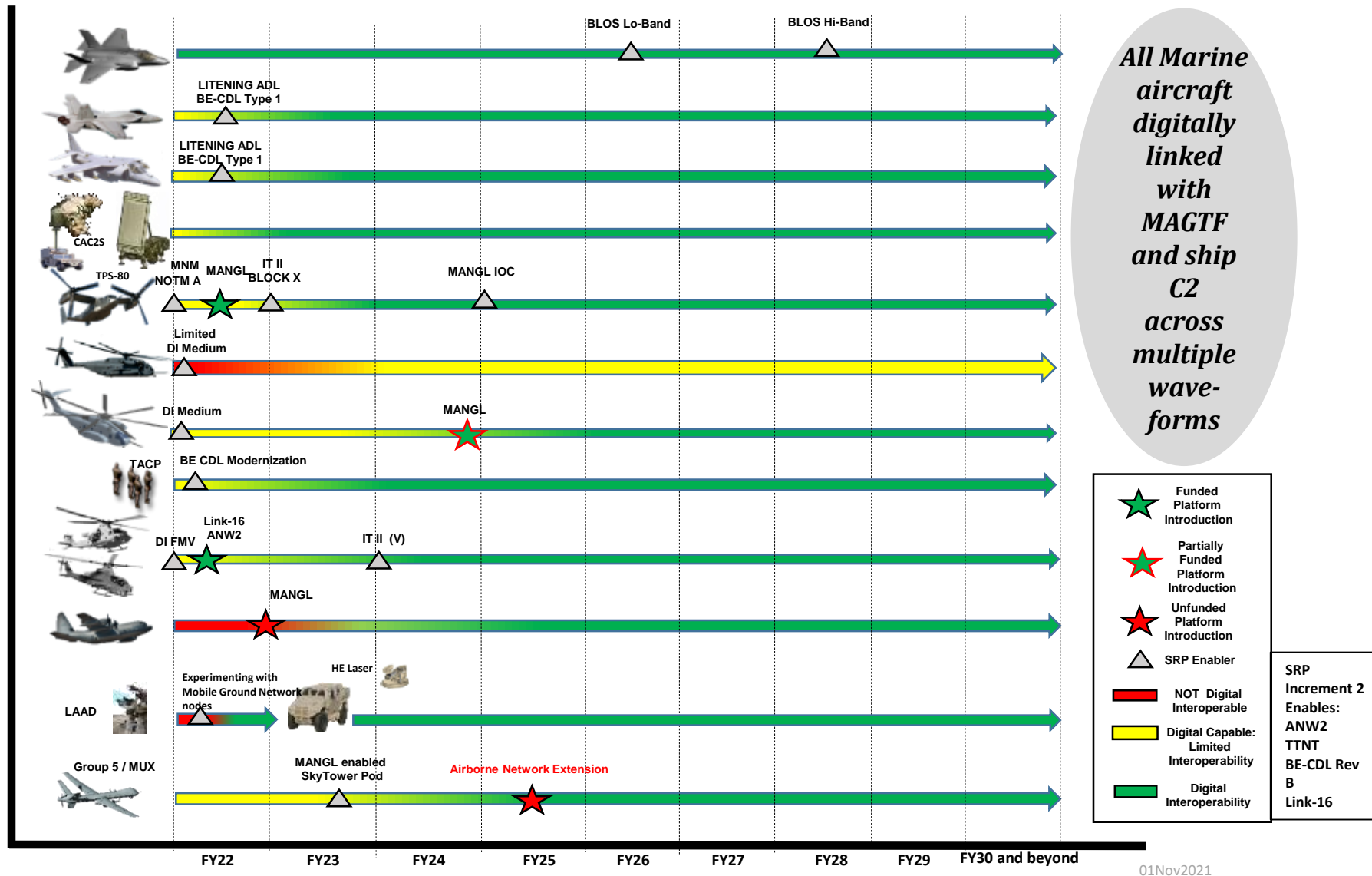
(MAGTAB). All three matured through fleet experimentation, multiple UUNS, and other platform deployments.

SOFTWARE RECONFIGURABLE PAYLOAD (SRP)

SRP is a software-defined radio that has the capability of hosting up to 7 waveforms simultaneously and contains an advanced multi-level cryptographic solution known as the Programmable Embedded Infosec Product (PEIP). Today, U.S. Navy UAS platforms employ SRP Increment 1.5. The following waveforms constitute the threshold SRP Increment 2; Link-16, ANW2, BE-CDL, and TTNT. Link-16 fulfills the air picture and enables growth for DACAS potential, ANW2 radios are commonplace across the Ground Combat Element, BE-CDL will meet the Type 1 encryption ISR mandate and a far more capable waveform that will enable the furthering of payload control, and TTNT enables a high-throughput, mesh network, terrestrial backhaul for range extension, and dynamic spectrum maneuvering. Most importantly, SRP can incorporate new waveforms developed by industry or mandated by MCCDC in 12-18 months and will scale simultaneously across all SRP enabled platforms. This shifts the paradigm on costly and slow integration of legacy radio systems on aviation platforms.



Our goal remains ensuring every platform is a sensor, shooter, and a sharer – able to move relevant tactical information throughout the spectrum and across the battlefield at light speed



AIRCRAFT SURVIVABILITY EQUIPMENT (ASE) PLAN

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

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

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

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

Funding Priorities	FY22 (\$K)	FY23 (\$K)	Impacts
AECM Wholeness (USMC)	\$61.6M Total \$6.3M USMC	\$111.4M Total \$13.5M USMC	Funds procurement of USMC countermeasures above critical inventory levels and JSF unique IR countermeasures in sufficient quantities to meet deployment package requirements. Increases procurement of MJU-61 low-cost training flare
APR-39D(V)2 Retrofit	\$18.2M APN-5	\$23.7M APN-5	Funding to retrofit 500 systems and integration efforts for CH-53E/MV-22/H-1 across FYDP.
DAIRCM AH-1Z/UH-1Y Cost Avoidance – Production and Fielding	\$26.8M RDTEN \$2.0M APN-5	\$13.1M RDTEN \$8.0M APN-5	Program procurement to support IOC. FY24 APN-5 procures 2 First Articles, 9 deployable A/B-kits, 1 spare shipset to support FY26 IOC H-1. FY25-26 APN for 12 A/B-Kits for LRP. Cost avoidance of \$73.3M Nonrecurring Engineering through integrated development and test. Fund 1 EDM, 3 PDMs and test spares to support AH-1Z and UH-1Y DAIRCM development.
Survivability Readiness Project 3308 Project 3309	\$2.9M USMC (3308) \$0.3M USMC (3309)	\$2.8M USMC (3308) \$0.3M USMC (3309)	Funds ability to quickly develop RF-IR countermeasure techniques (jamming and CM dispensing) thru test and fielding of countermeasures without A-Kit or B-Kit changes. 3309 also includes DAIRCM, DoN LAIRCM and APR-39D(V)2 specific test (including Live Fire) and capability development to support USMC ASE requirements. 3308 includes RFCM technique development to support USMC RW TACAIR ASE needs.
DoN LAIRCM Production and Installation	\$0.0M RDTEN \$37.7 M APN-5	\$0.0M RDTEN \$47.4M APN-5	Funding to procure an additional (115) AAQ-24 systems across the FYDP to meet planned MV-22, KC-130J, and CH-53E production/retrofit lines to support Program of Record requirement shortfalls. Procures new sensors and processors (current GLTA)
DoN LAIRCM GLTA Upgrade	\$0.0M	\$0.0M	R&D for Guardian Laser Turret Assembly (GLTA) upgrades with advanced laser technology; improve IRCM performance; leverage MSSD FNC "RAPIER" to develop/deliver EO/IR CM technologies, techniques, and components to defeat multi-spectral threats.

MARINE AVIATION ASSAULT SUPPORT ASE PLAN

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

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

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

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



Dispensing Set (CMDS) for determination of the appropriate dispense response. The APR-39D(V)2 will correct major deficiencies and obsolescence in the current version.

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

TECHNOLOGY TRANSITION AGREEMENTS (TTAs)

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

MARINE AVIATION ASSAULT SUPPORT ASE PLAN

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

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

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

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

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

FUTURE NAVAL CAPABILITY (FNC)

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

MARINE CURRENT ASE

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



MV-22B
 APR-39A(V)2
 APR-39C(V)2
 AAR-47E(V)2
 ALE-47
 AAQ-24



UH-1Y
 APR-39B(V)2
APR-39D(V)2
 AAR-47E(V)2
 ALE-47
AAQ-45



AH-1Z
 APR-39B(V)2
APR-39D(V)2
 AAR-47E(V)2
 ALE-47
AAQ-45



CH-53E
 AAR-47E(V)2
 APR-39(V)1
APR-39D(V)2
 ALE-47
 AAQ-24(V)25



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



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



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



F/A-18A/A+/B/C/D
 ALR-67(V)2 / (V)3
 ALQ-126B
 ALQ-165
 ALQ-214(V)5* (*in process*)
 ALE-39/ALE-47

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

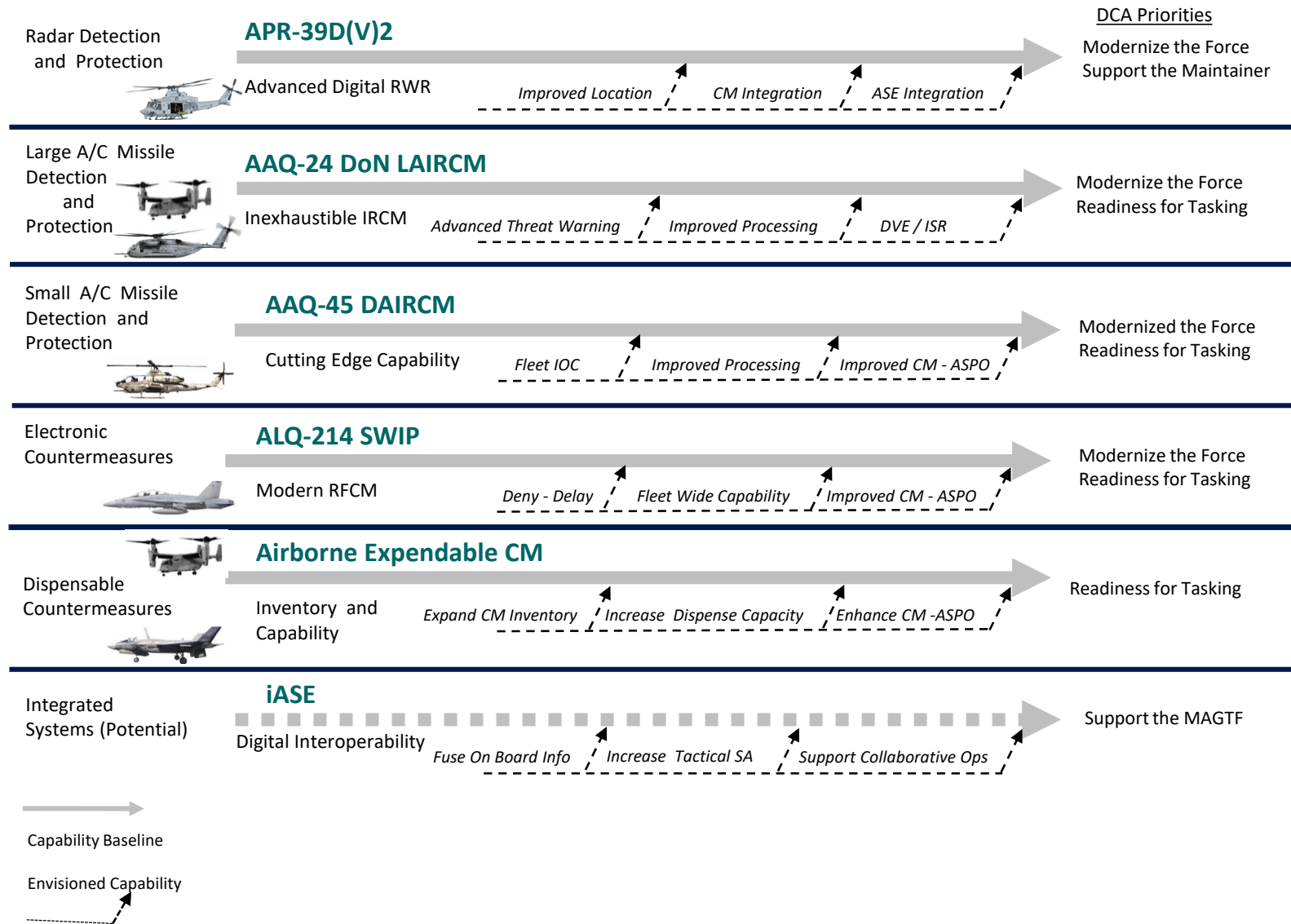


AAR-47E(V)2
 ALE-47



UC-35
 AAR-57
 ALE-47

MARINE ASE PATH FORWARD

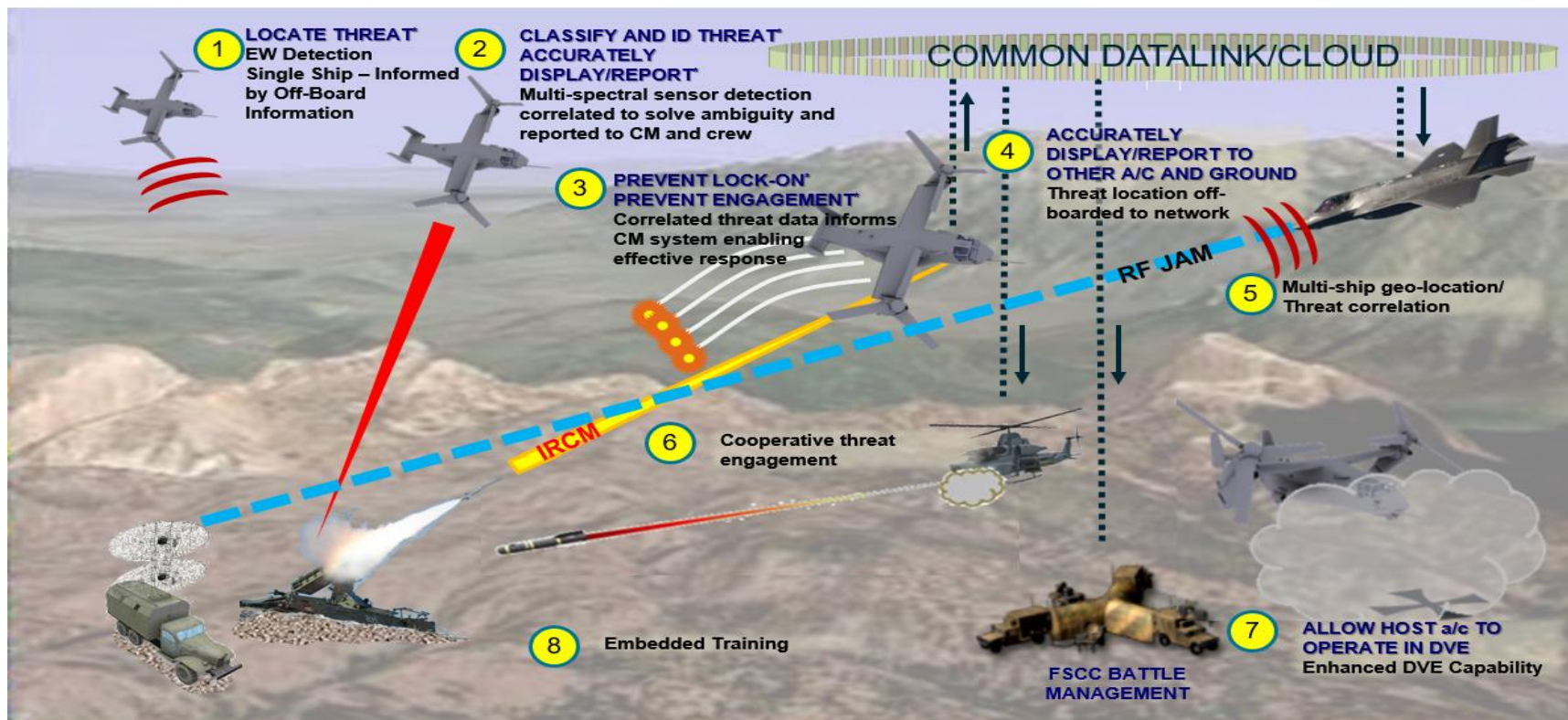


INTEGRATED AIRCRAFT SURVIVABILITY EQUIPMENT

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

Required CAPABILITY:

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



- 
- 4.1 Marine Aviation Expeditionary Enablers
 - 4.2 Tactical Air Control Party
 - 4.3 Marine Aviation Synthetic Training
 - 4.4 Military Construction

SECTION 4

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

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 adds to the strength of a force.

Marine Corps Doctrinal Publication 1-0

The Future of Aviation C2 Is Now

The Campaign of Learning that has coincided with the implementation of Force Design 2030 continues to highlight the criticality of the Marine Corps' aviation expeditionary enablers because they optimize the control of aircraft and missiles in a peer-competitor competition, create unity of effort within the naval force, and enhance joint force lethality. The contributions of aviation's enablers – the ability to control and defend our own airspace; execute combat ID, close kill chains/webs, and integrate fires; and enabling sustained sortie generation from expeditionary sites - equates to freedom of action for Marine and joint force commanders. As the joint force fields exponentially more capable systems, the ways in which **aviation expeditionary enablers allow freedom of action** must evolve as well. The MACCS and AGS communities will continue to innovate and develop updated concepts of employment that embrace evolving technology and are in line with the Commandant's vision for Force Design 2030.

Aviation command and control and aviation ground support have been under the cognizance of Marine Aviation since their inception during World War II. Air defense was brought into Marine Aviation in the early 1960s when the MACCS as we know it today began to take shape. As part of Force Design 2030, a portion of the MACCS and AGS community's combat power is migrating to the 3d Marine Division in order to support stand-in-force operations in the first island chain.



As part of the Marine Littoral Regiment (MLR), the Littoral Anti-Air Battalion (LAAB) is capable of conducting short range ground based air defense, providing forward arming and refueling, conducting airspace surveillance, supporting littoral targeting, and conducting air direction and air control in support of expeditionary advance base operations (EABO).

Lethality Across the Competition Continuum

To support EABO, the Marine Corps must have coherence between the MACCS and the LAAB with aviation C2 units that are fundamentally joint, inherently naval, while still focused on integrating ACE, GCE, and LCE operations. Whether operating as part of a LAAB or as part of a traditional aviation C2 agency, AC2 units must be capable of providing robust sensor coverage in support of the recon/counter recon mission, credible air and missile defense capabilities to defend stand-in-forces, and all-domain command and control required to prosecute successful naval campaigns in the future. These units must also be able to integrate Operations in the Information Environment (OIE) capabilities in order to maintain custody of targets at all levels, provide and maintain decision advantage, and control aircraft and missiles that hold adversary targets at risk.

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

THE LITTORAL ANTI-AIR BATTALION

Before moving forward it is important to quickly describe the LAAB and what it provides in support of the Marine Littoral Regiment (MLR). The LAAB provides task organized aviation enabler elements in support of expeditionary advanced base operations that are capable of rapidly dispersing in key maritime terrain in order to assist the MLR commander in sensing and making sense of their operating environment across the entirety of the competition continuum. The LAAB is key to the integrated fires and force protection of the MLR as a stand-in force within the first island chain. Most importantly, the LAAB allows the MLR to close tenuous kill webs as the stand in force transitions to the early blunt phase.

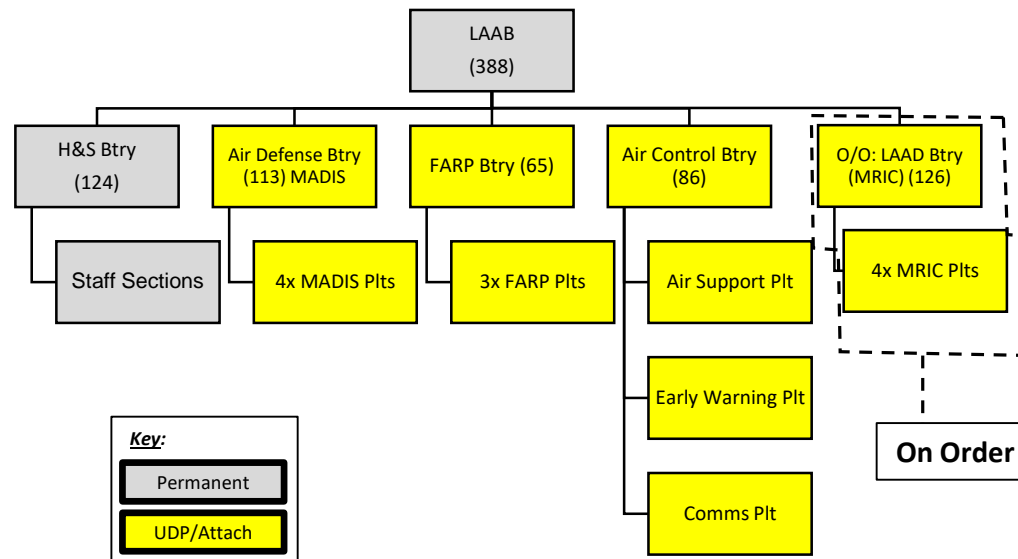
The LAAB Commander may be designated as the Sector Air Defense Commander/ Regional Defense Commander (SADC/RADC) by the Area

Air Defense Commander. With in a Composite Warfare Commander (CWC) construct, the LAAB Commander may be delegated authority to execute its mission under the Air and Missile Defense Commander. The LAAB Headquarters will also be capable of supporting the MLRs participation in joint/naval targeting of multi-domain fires.

The battalion consists of four subordinate elements

- 1) H&S Battery – Battalion command, staff, & support personnel
- 2) Air Defense Battery – MADIS-equipped battery capable of defending four critical assets
- 3) Air Control Battery – conducts air direction, air control, and air surveillance as directed by the Airspace Control Plan and Area Air Defense Plan.
- 4) FARP Battery – capable of supporting three FARPs as directed by the Air Tasking Order (ATO)

Future additions to the LAAB may include a Medium Range Intercept Capability (MRIC) battery to provide counter cruise missile defense.



LAAB Mission: Conduct maneuverable ground-based air defense, forward aircraft arming and refueling, and air control in support of anti-air warfare and sea denial within a contested maritime environment in order to enable fleet operations.

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

MACCS & AGS Way Forward

As the MACCS and AGS communities experiment and adjust their current posture to meet new requirements driven by Force Design, they must remain capable of supporting their core missions throughout the modernization efforts. While development of TTPs for LAAB employment are central to future success, the MACCS must also continue to develop and refine employment techniques that provide low-signature, reduced footprint, and increased survivability and lethality for our teams, elements, and centers that continue to support traditional Marine Air Control Group and AGS missions.

Traditionally the MACCS has served as the facilitator for the timely employment of Marine aviation assets and the effective application of combined arms. Although a MAGTF asset and force multiplier, the MACCS has always remained focused on the “up and out” by serving as a facilitator for Marine Corps participation in naval and joint operations. Future Aviation C2 doctrine must continue to rely on “system centric” TTPs and delegated authorities to ensure that they do not fall hostage to legacy processes that rely on vertical C2 pathways.

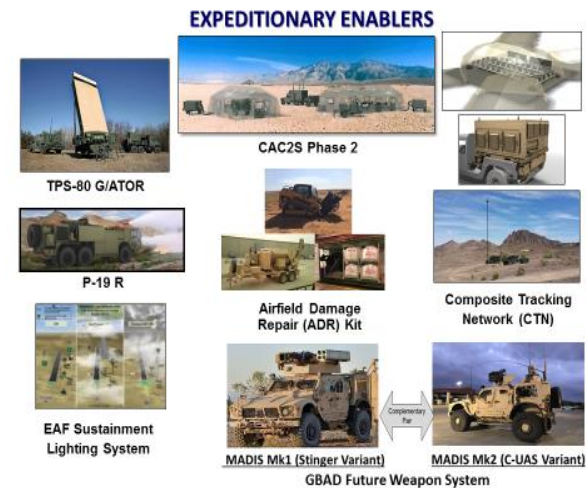
We must recognize the significant challenges of the future operating environment and develop an aligned approach to fight and win. The **MACCS and AGS communities enable the MAGTF commander to maintain control of the battlespace**, maximize effects, and shorten the kill web. The Aviation Command and Control family of systems (CAC2S, TPS-80

G/ATOR, and CTN) provides game-changing capabilities and ensures continued freedom of action.

The coordination requirements for both organic and non-organic long-range precision fires, has highlighted the centrality of MACCS skillsets and equipment in realizing the service’s vision for Force Design 2030. The proliferation and persistent presence of UAS and civilian aircraft throughout the AO requires that all MACCS agencies have access to an integrated air picture. Integration with special operations forces and the increased capabilities of MAGTF platforms, such as the F-35 and MV-22, demand hybrid employment options for MACCS agencies as we modernize and align our equipment and personnel.

The current configuration of the MACCS into large, Cold War agencies aligned to functional lines must change. The future operating environment demands small and agile distributed forces capable of multifunctional operations. The MACCS is primed to embark on a period of experimentation to validate current organization or establish new methods of organization and training that best support the future force.

The four core missions of the MACCS - air command, air defense, air support, and air traffic control – will remain currently aligned to legacy agencies until experimentation is complete. To that end, until experimentation is complete, the following traditional MACCS agencies will continue to support Fleet Marine Force operations around the globe:



MARINE EXPEDITIONARY ENABLERS:

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

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. Force Design 2030 saw the Marine Tactical Air Command Squadrons (MTACS) stood down, to provide the flag and headquarters for the newly formed LAAB and in favor of TACC companies that now reside at the Marine Air Control Group (MACG) Headquarters. This change does not impede the operational functionality of the TACC as a C2 agency. The TACC provides the **functional interface for employment of USMC aviation in joint and multinational operations.**

TACTICAL AIR OPERATIONS CENTER (TAOC)

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

The combined capabilities of CAC2S, CTN, and TPS-80 paired with the development and employment of passive detection capabilities put the TAOC at the forefront of force protection and Integrated Air and Missile Defense (IAMD) for the MAGTF.

DIRECT AIR SUPPORT CENTER (DASC)

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

With the fielding of CAC2S Phase II, 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.

The DASC has also been changed under the requirements of Force Design. An internal reorganization of the Marine Air Support Squadron (MASS) will see the establishment of two Air Support Companies.



MARINE AIR TRAFFIC CONTROL (MATC)

MATC provides all-weather air traffic control (ATC) services to friendly aircraft operating within their assigned airspace. Each MATC company is trained and equipped to provide ATC services to one main air base and two remote air sites simultaneously. The continued development of the highly expeditionary Air Traffic Navigation, Integration, and Coordination System (ATNAVICS) has ensured MATC's ability to meet mission requirements across the range of military operations with increasing interoperability and functionality as an Aviation Command and Control (AC2) node within the Marine Air Command and Control System (MACCS), until fielding of future systems. Normally focused upon safe handling of air traffic within their assigned airspace, MATC has initiated efforts that will increase their contribution to the overall Integrated Air Defense System (IADS) and the Integrated Fire Control (IFC), Counter Cruise Missile (CCM), Counter UAS, and the EABO Concepts.

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

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

**LOW ALTITUDE AIR DEFENSE BATTALION
(LAAD)**

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

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

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



**MARINE WING COMMUNICATIONS
SQUADRON (MWCS)**

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

**METEOROLOGICAL AND OCEANOGRAPHIC
(METOC)**

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

The AN/TMQ-56 Meteorological Mobile Facility (Replacement) Next Generation [METMF(R) NEXGEN] is currently executing a Service Life Extension Program (SLEP) to a V3 containerized platform aimed and modularization and modernization with fielding anticipated between FY23-FY24. The SLEP extends program end of life to FY30 and beyond while making it a truly scalable system. Capabilities include NOWcast forecast modeling, satellite reception, Doppler weather radar, upper air sensing and, local and remote surface based sensors and mission impact assessments to support a variety of FMF deployments and operations.

Additionally, METOC Support Teams (MST), sourced from either the MACS MATC Company or the Intelligence Battalion, utilize the stand-alone Naval Integrated Tactical Environment Subsystem – Next Generation (NITES-Next), to provide METOC support to forward operating bases (FOBs) for any FMF mission.

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

FUTURE MACCS EMPLOYMENT

Marines in combat will always need air support, air defense/surveillance, and a command post for the ACE. Current large, stovepiped legacy agencies and unit organization can no longer remain the baseline for the MACCS as the service re-designs itself to support Force Design 2030. Our current structure has proven successful during sustained operations over the past 20 years. However, this structure is not properly organized, trained, and equipped to support future warfighting needs.

As the Marine Corps rebalances its forces to support increasingly dispersed operations with smaller forces over greater distances, aviation C2 must adapt by providing new employment options 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 can 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 lethal

and non-lethal family of systems, leveraging different joint, service, and multinational force capabilities will be successful. Future GBAD systems must be capable of countering enemy UAS as the primary threat with the secondary threat being cruise missiles followed by manned FW/RW aircraft. Future systems must consider a range of effectors to include: directed energy, high-power microwave, kinetic missiles and guns, and electronic warfare.

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

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

FUTURE MACCS EMPLOYMENT

The future MACCS will provide organic AC2 and air defense that is scalable and agile, essential to aviation operations that enable Force Design

<ul style="list-style-type: none"> • 24/7 crew, all AC2 functions. • Pure multi-functionality or task organized to perform as single-function air defense (TAOC) or air support (DASC) agency. • Increased flexibility for multi employment options • Perform broader naval / joint tasking like SADC, CWC "P," "Q," "W," "Z" 	<div style="background-color: #c00000; color: white; padding: 10px; border-radius: 10px; width: fit-content; margin: 0 auto;"> <p>MAOC Multifunction Air Operations Center</p> </div>
<ul style="list-style-type: none"> • Task-organized, 24/7 crew, performing tailored AC2 functions in smaller airspace than MAOC. • Similar to Air Support Element or Early Warning & Control Detachment. • Act as MAOC extension or independent ops. • No SADC/CWC duties without augmentation 	<div style="background-color: #70ad47; color: white; padding: 10px; border-radius: 10px; width: fit-content; margin: 0 auto;"> <p>TACE Tactical Air Control Element</p> </div>
<ul style="list-style-type: none"> • Small teams performing specific AC2 missions. Deploy/employ limited equipment & personnel. • MCT executes digitally-aided procedural control over limited AO, supported by SFF CAC2s. • MLT similar to today's ASLT. • SNSR TM deploys TPS-80 and CTN for CEC fires integration • RT TM employs remote radio sites to extend comm coverage 	<div style="background-color: #e69d00; color: white; padding: 10px; border-radius: 10px; width: fit-content; margin: 0 auto; text-align: center;"> <p>MACCS Control Team</p> </div> <div style="background-color: #e69d00; color: white; padding: 10px; border-radius: 10px; width: fit-content; margin: 0 auto; text-align: center;"> <p>MACCS Liaison Team</p> </div> <div style="background-color: #e69d00; color: white; padding: 10px; border-radius: 10px; width: fit-content; margin: 0 auto; text-align: center;"> <p>Sensor Network Relay Team</p> </div> <div style="background-color: #e69d00; color: white; padding: 10px; border-radius: 10px; width: fit-content; margin: 0 auto; text-align: center;"> <p>Remote Transmission Team</p> </div>

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

AMPHIBIOUS COMMAND AND CONTROL

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

Marine commanders must possess the ability to command and control their forces in support of an increasingly distributed and increasingly diverse mission set. They also must be able to provide the full range of MACCS capabilities from the sea base. Marine Corps Aviation and Tactical Air Control Group (TACGRU) leadership continue to support a naval integration Memorandum of Understanding (MOU) that formalizes the agreement to integrate aviation command and control Marines into sea-based operations in order to optimize MAGTF littoral capabilities.

Our current lines of effort include aviation command and control Marines attending Tactical Air Control Squadron (TACRON) training to integrate with the Supporting Arms

Coordination Center (SACC), Navy Tactical Air Control Center (NTACC) and the Landing Force Operations Center (LFOC) for future MEU deployments. Additionally, Joint Interface Control Officers (JICOs) and tactical data link operators are augmenting the TACRON staff on MEU deployments while TACRON personnel are attending WTI as Command, Control and Communications (C3) students. The goal is to have at least one TACRON member per MEU who is a WTI course graduate. This is required due to advanced aircraft capabilities emerging simultaneously with an increase in disaggregated and distributed operations afloat.

As new Marine aviation platforms begin to field, they provide more capability and higher fidelity information to ships via new sensors and gateways, enabling such concepts as Sea Shield and Sea Strike. Forward-deployed C2 nodes equipped with CTN, CAC2S, and a TPS-80 contribute fire control quality data to the naval force. These advancements in technology, paired with the GCE use of tactical data links, requires expert management and design by the Command and Control Interface Control Officers of the MAGTF.

Our sea-based C2 integration enhances 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 are positioned to process, integrate, and operationalize this myriad of information in support of MAGTF operations.

**MARINE EXPEDITIONARY ENABLERS:
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INTEGRATED FIRE CONTROL (IFC)

VALUE TO THE MAGTF

The MAGTF must be able to enable, support, and close advanced digital fire control kill webs with the naval and joint force. IFC is the concept to connect sensors from all of the military services—Air Force, Army, Marine Corps, Navy, and Space Force—into a fused network. Providing a cloud-like environment for the joint force to share intelligence, surveillance, and reconnaissance data, transmitting across many communications networks, to enable faster decision-making. IFC will enable commanders to make better decisions by collecting data from numerous sensors, processing the data using artificial intelligence algorithms to identify targets, then recommend the optimal weapon system—both kinetic and non-kinetic (e.g., cyber or electronic weapons)—to engage the target. Adopting the “Any sensor, Any effector” mindset, this ecosystem of information will enable commanders to make better decisions by collecting data from numerous sensors, processing the data using artificial intelligence algorithms to identify targets, then recommending the optimal weapon—both kinetic and non-kinetic (e.g., cyber or electronic weapons)—to engage the target.

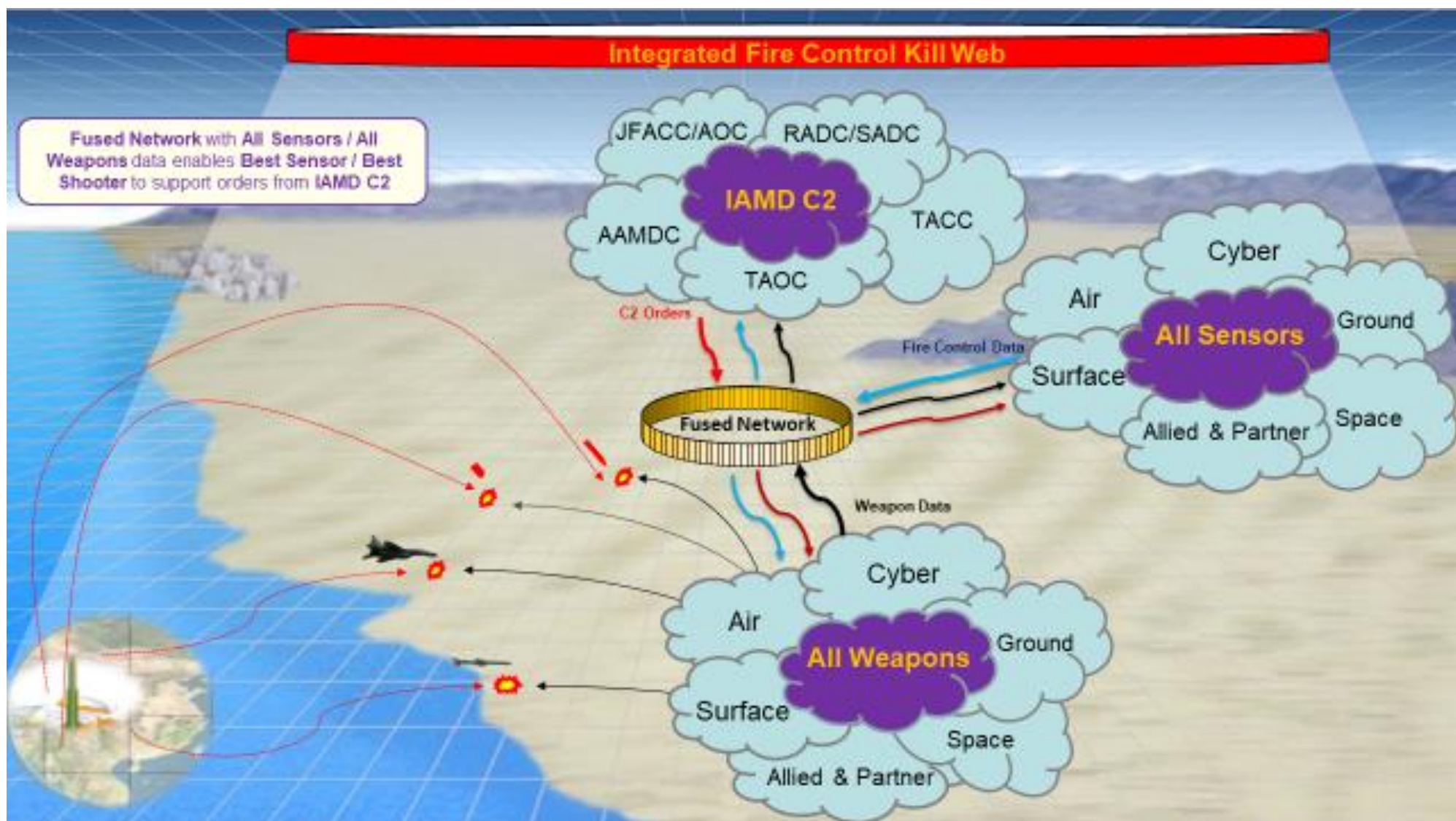
IFC Advantages:

Through the employment of advanced TDLs, composite tracking, active and passive sensor capabilities, 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. Through many system upgrades and advances, MACCS operators have redefined the MAGTF’s digital architecture, standards, and concepts. The key concept to ensure the MACCS is capable of holding targets at risk, is Integrated Fire Control. IFC provides several advantages for the MAGTF:

- 1. Decreased Reaction time** 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 and networks, providing better context of who is in the airspace.
- 3. Defense-in-depth** will be increased through the use of data from non-organic sensors. This provides 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 as weapons systems rely on multiple sensors for firing solutions and be used at maximum effective kinematic range.

**MARINE EXPEDITIONARY ENABLERS:
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INTEGRATED FIRE CONTROL KILL WEB

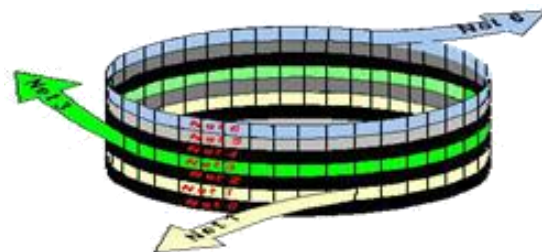


**MARINE EXPEDITIONARY ENABLERS:
MARINE AIR COMMAND AND CONTROL
SYSTEM (MACCS) AND AVIATION GROUND
SUPPORT (AGS) PLAN**

DIGITAL INTEROPERABILITY

Digital interoperability and the use of tactical data links is a key component in the creation of ACE combat power and a key goal outlined by our Commandant as we implement the National Defense Strategy. MACCS Marines and systems continue to serve as the integrator and are focused on tactical air, maritime, 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.



MACCS Marines will continue to support the MAGTF with this expertise through Command and Control Interface Control Officers (C2ICO). These ICOs will analyze, plan, design, execute, and manage the MAGTF common tactical picture (CTP) and integrate the service's CTP with the Joint Task Force (JTF) Commander's common operational picture (COP). The C2 ICO ensures available interfaces are optimized to achieve the Marine Corps' end-to-end information exchange requirements and flow required to execute advanced digital mission threads and kill webs in a naval and joint force environment.

The MACCS will also be a key component of digital kill webs. 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, through the C2 ICO, 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 web, increase situational awareness, and enhance survivability.

**MARINE EXPEDITIONARY ENABLERS:
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PLAN**

AVIATION C2 FAMILY OF SYSTEMS (AC2 FOS)

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 fielding to the operating forces to modernize the ACE.

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

COMMON AVIATION COMMAND AND CONTROL SYSTEM (CAC2S)

VALUE TO THE MAGTF

CAC2S distributes 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. Enabling enhanced air control, improved situational awareness, sensor integration, full TDL integration improved planning and command

functionality and sensor-netting integration. In concert with CTN and TPS-80 CAC2S fuses real, near and non-real time data providing a common operational picture across the MACCS utilizing common gear for the TACC, DASC and TAOC.

System Description

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. Fuses real-time, near, and non real-time data
3. Common hardware, software, equipment, and facilities
4. Provides data fusion and sensor integration to TACC/TAOC/DASC
5. Interoperable with MACCS organic sensors and weapons systems; fosters joint interoperability

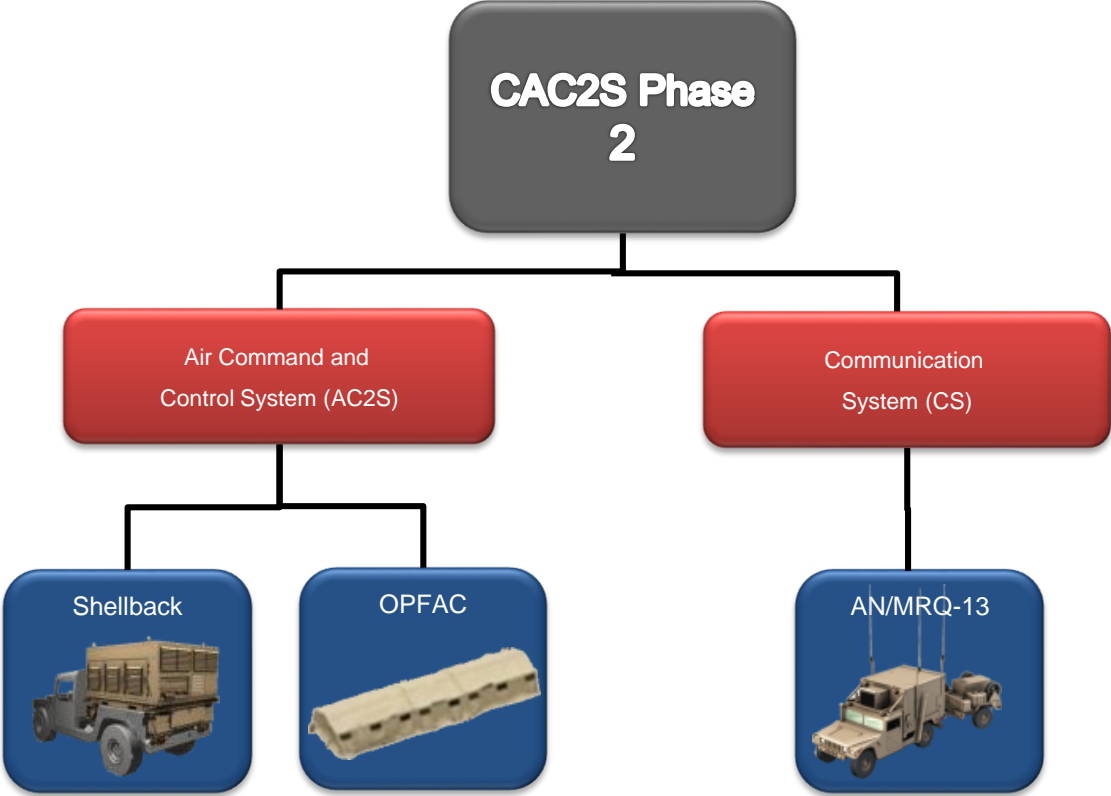
Fielding

- System FOC summer 2021
- AAO (50) Aviation Command and Control Systems (AC2S)
- (75) Communication Subsystems (CS)

CAC2S Phase II provides:

- TACC (176 seats)
- TAOC (17 seats)
- DASC (17 seats)

**MARINE EXPEDITIONARY ENABLERS:
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**MARINE EXPEDITIONARY ENABLERS:
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SMALL FORM FACTOR

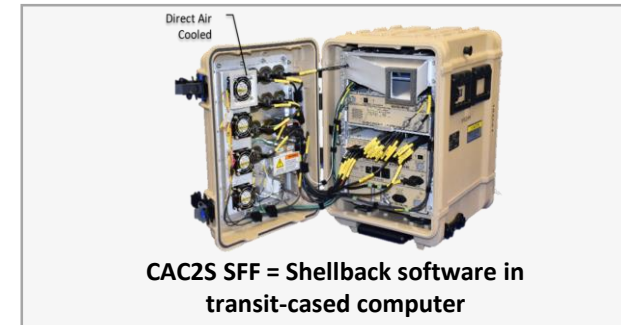
- First low rate initial production system expected in FY23
- AAO (37) CAC2S SFF systems

Program Overview:

- Rapid maneuverability of the team enabled by system man-transportability
- Flexibility and task-adaptability enabled by a common software baseline
- Survivability enhanced by distribution or dispersion of the C2 network
- Minimized physical signature
- Reduced logistics demand

CAC2S SFF provides:

- CAC2S SFF supports rapid, frequent displacement and employment
- Capable of operating for a minimum of 72 hours at a location
- Ensure seamless, resilient operations through a network of CAC2S SFF nodes
- Tailorable to support between 2-12 crew positions



**MARINE EXPEDITIONARY ENABLERS:
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**THEATER BATTLE MANAGEMENT CORE
SYSTEM (TBMCS)**

Value to the MAGTF

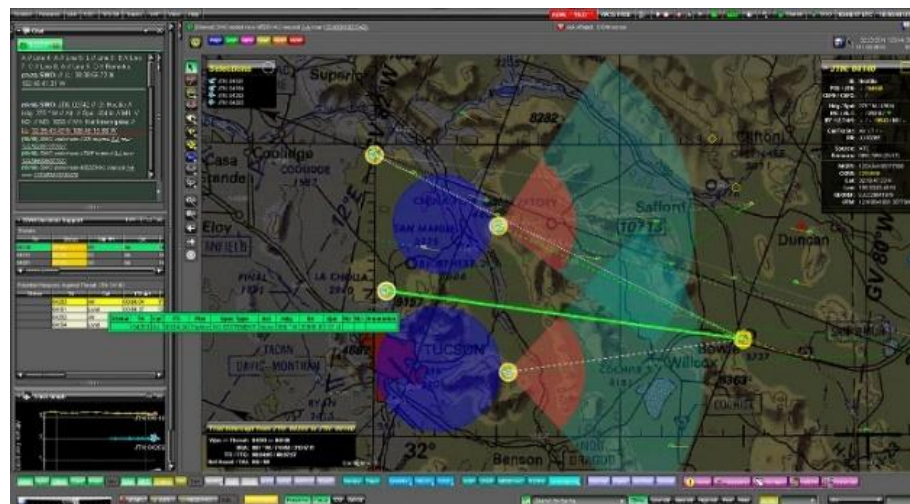
Theater Battle Management Core System (TBMCS) is a Joint Chiefs of Staff (JCS) mandated air war planning tool for the generation, dissemination and execution of air tasking orders and airspace coordination orders. TBMCS is the primary system utilized for airspace command and control (AC2) assault support processing and execution, and provides the Aviation Combat Element commander the ability to support the Joint Force Air Component Commander (JFACC). TBMCS provides automated tools to conduct:

- Situational awareness (SA) and assessment
- Airspace management
- Planning execution management (including United States Marine Corps assault support processing and execution)
- Close air support (CAS)
- Targeting and weapon engagement plans
- Time Critical Targeting

Program Overview

In the future, TBMCS is programmed to be replaced by future aviation C2 and planning software that has recently been placed on the Air Force Pathfinder/Kessel Run program to speed acquisition and streamline software development which may affect USMC acquisition.

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



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COMPOSITE TRACKING NETWORK

VALUE TO THE MAGTF

The Composite Tracking Network (CTN) system is vital to support the MAGTF's interoperability with the naval force. The 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.

Program Overview

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. The CTN has been updated to provide fully functional send and receive capability, and provides the CEC network data produced by the TPS-80. This capability strengthens the connectivity and situational awareness between the MAGTF's littoral forces and the Navy. CTN provides an avenue of new TTPs for naval forces in posture and asset management in the maritime domain, along with new TTPs in advanced digital kill webs.



The Composite Tracking Network (CTN) system is a truck-portable radio antenna that allows line-of-sight connection to the Cooperative Engagement Capability (CEC).

**MARINE EXPEDITIONARY ENABLERS:
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**MULTI-DOMAIN RADAR FOR A
CONTESTED ENVIRONMENT (MuDRACE)**

VALUE TO THE MAGTF

MuDRACE is a low-probability of detection (LPD) mobile, remote sensing system used for air surveillance. It provides air surveillance information to air command and control (AC2) nodes for processing, operator actions, and distribution to other command and control organizations and agencies via sensor networks and tactical data links. MuDRACE is designed to augment existing active surveillance capabilities and increase air surveillance persistence by reducing RF emissions.



Program Overview:

- Inexpensive, expeditionary, multi-domain, distributed radar
- Extreme low probability of intercept / low probability of detection
- Maintain near-peer situational awareness advantage

Way Forward:

- Establish an office within PEO Land Systems in the G/ATOR PM to field the MuDRACE system facilitating joint integration
- Develop TTPs and DOTMLPF to facilitate rapid fielding
- Partner with US Army STARE program office to ensure joint capability

**MARINE EXPEDITIONARY ENABLERS:
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GROUND AIR TASK ORIENTED RADAR (AN/TPS-80)

VALUE TO THE MAGTF

The Ground/Air Task Oriented Radar (G/ATOR) replaces five current single-mission systems as the new “Eyes of the MAGTF”. G/ATOR is critical to maintain a competitive edge and support the Commandant’s goals and blueprint of FD 2030. The G/ATOR provides mobile, highly accurate, and reliable surveillance of air breathing targets, cruise missiles, UAS, rockets, artillery and mortars. **The G/ATOR enables both decision advantage and maneuver advantage for DMO, LOCE, and EABO through detection of enemy air threats** not seen by Navy sensors in the littorals and participating in a cooperative engagement network of sensors and shooters. **G/ATOR is a key enabler for Joint Integrated Fire Control (JIFC) and provides engage/fire on remote capability, solidifying the role of the MACCS in integrated air and missile defense (IAMD).**

Program Overview

G/ATOR is a ground-based, multi-role, active electronically scanned array (AESA), three-dimensional (3D) expeditionary radar system employed by both the ACE and GCE within the MAGTF. This (AESA) radar is software defined with

a common hardware baseline. The ability to define the radar’s mission provides a long-term solution for air surveillance, air traffic control, counter-battery, and weapons control that is adaptable with technological developments. G/ATOR detects and tracks the most challenging indirect fire and low observable/low radar cross-section air threats at tactically significant ranges.

G/ATOR, combined with CAC2S and CTN, ensures **no service is more capable than the Marine Corps in controlling USMC airspace in support of Maritime Operations**; it is the foundation for the Joint Force Air Component Commander’s (JFACC) delegation of airspace to the Marine Corps.

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 / unfunded).

Updates

1. On schedule to achieve full operational capability (FOC) in early fiscal year 2025.
2. G/ATOR was successfully deployed to Norway in support of Exercise Trident Juncture in November 2018 and to Australia in support of Exercise Talisman Saber in July 2019.
3. Initial testing of the G/ATOR’s ability to support advanced kill chains and Mode 5 is ongoing.
4. Long range capability testing continues, demonstrating additional capability and potential future employment options.



**AN/TPS-80 Ground/Air Task Oriented Radar (G/ATOR)
Air Surveillance/Air Defense and Air Traffic Control
Radar**

G/ATOR FIELDING PLAN

FY	Unit	Location	Qty
FY18	MACS-1 TAOC	MCAS Yuma	1
	MACS-2 TAOC	MCAS Cherry Point	1
FY19	11th Marines	Camp Pendleton	4
	10th Marines	Camp Lejeune	2
FY20	MACS-4 TAOC	MCAS Futenma, Okinawa	1
	USMC Artillery Det	Fort Sill	1
	12th Marines	Camp Hansen, Okinawa	2
FY21	MCSC	MCSC	1
	MCCES	MAGTF TC 29 Palms	1
	MACS-4 Air Defense Co A	MCAS Futenma, Okinawa	1
	MACS-1 EW/C	Camp Pendleton	1
FY22	MACS-2 EW/C	MCAS Beaufort	1
	MCTSSA	Camp Pendleton	1
	MACS-24 TAOC	Va Beach	1
	3d LAAB	MCAS Kanohe Bay	1
	MACS-4 Air Defense Co B	MCAS Iwakuni, JP	1
	USMC Artillery Det	Fort Sill	1
	14th Marines	Fort Worth	1
FY23	12th Marines	Camp Hansen, Okinawa	1
	10th Marines	Camp Lejeune	1
	14th Marines	Fort Worth	1
	MACS-1 TAOC	MCAS Yuma	1
	11th Marines	Camp Pendleton	1
	MACS-2 TAOC	MCAS Cherry Point	1
	10th Marines	Camp Lejeune	1
	12th Marines	Camp Hansen, Okinawa	1
FY24	MACS-24 TAOC	Va Beach	1
	11th Marines	Camp Pendleton	1
	10th Marines	Camp Lejeune	1
	DMFA AD/SR	Tobyhanna Army Depot	1
	MACS-24 EWC	Va Beach	1
	11th Marines	Camp Pendleton	2
	10th Marines	Camp Lejeune	1
FY25	14th Marines	Fort Worth	2
	12th Marines	Camp Hansen, Okinawa	1
	DMFA AD/SR	Tobyhanna Army Depot	1
	DMFA GWLR	Tobyhanna Army Depot	1

**MARINE EXPEDITIONARY ENABLERS:
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MARINE AIR TRAFFIC CONTROL

VALUE TO THE MAGTF

Marine Air Traffic Control (MATC) represents the Department of Defense's only full Instrument Flight Rules (IFR) expeditionary air traffic control (ATC) capability. MATC provides positive radar, tower, Tactical Air Navigation (TACAN), Terminal Instrument Procedures (TERPS), Marine ATC Mobile Team (MMT), and precision recovery services for MAGTF, joint, Coalition, and friendly aircraft. These capabilities are critical enablers of sortie generation and afford the MAGTF the ability to conduct all weather aviation operations.

Program Overview

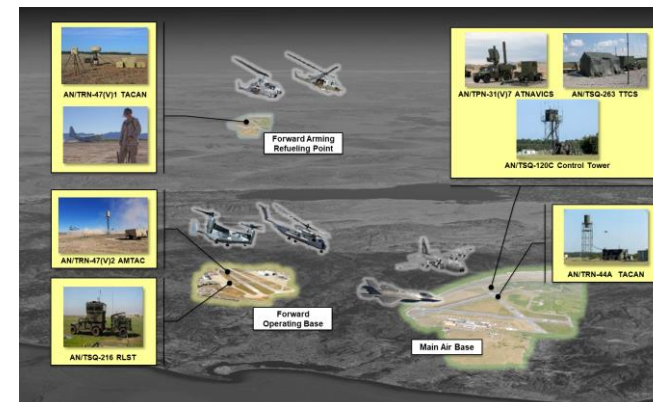
MATC provides all-weather air traffic control services to friendly aircraft operating within their assigned airspace. Each MATC company is trained and equipped to provide ATC services to one main air base and two remote air sites simultaneously. The continued development of the highly expeditionary Air Traffic Navigation, Integration, and Coordination System (ATNAVICS) has ensured MATC's ability to meet mission requirements across the range of military operations with

increasing interoperability and functionality as an Aviation Command and Control (AC2) node within the Marine Air Command and Control System (MACCS), until fielding of future systems. Normally focused upon safe handling of air traffic within their assigned airspace, MATC has initiated efforts that will increase their contribution to the overall Integrated Air Defense System (IADS) and the Integrated Fire Control (IFC), Counter Cruise Missile (CCM), Counter UAS, and the EABO Concepts.

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

MATC Funding Priorities:

- 1. Common Aviation Command and Control System (CAC2S).**
- 2. AN/TPN-31(V)7 ATNAVICS Precision Approach Radar (PAR) Replacement with a Low Power Radar (LPR).**
- 3. Extending the AN/TRN-47(v)2 Airfield Mobile Tactical Air Navigation (AMTAC) system service life and replacing the AN/TRN-47(v)1 Tactical Air Navigation (TACAN) system.**



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PLAN**

CAC2S: The Common Aviation Command and Control System provides a complete and coordinated modernization of MACCS equipment. The system eliminates current dissimilar systems and provides the Marine Corps with hardware, software and facilities necessary to effectively coordinate air operations integrated with naval, joint and/or combined command and control (C2) units. The MATC community is currently unable to execute the output standards of their assigned Mission Essential Tasks (METs). The AN/TPN-31A C2 system, AN/TSQ-263, does not meet the requirement to provide radar surveillance data to the MAGTF or joint force via tactical data link. Interoperability challenges further limit MATC's ability to unconditionally meet the requirement to provide sustained integration with the MACCS. Fielding of CAC2S to MATC detachments eliminates these gaps and produces a more efficient and effective MACCS and IADS while increasing the lethality of the joint force.

AN/TPN-31(V)7 ATNAVICS PAR Replacement: The current ATNAVICS PAR has significant ongoing obsolescence issues and does not meet the requirement of a multiple touchdown point capable system. This effort will capitalize on emerging

technology and provides a small form factor precision recovery system that supports the Marine Corps' Expeditionary Advanced Base Operations Concept. This system will need to meet all current requirements and will be a one for one replacement of the current PAR.

Extending the AN/TRN-47(v)2 Airfield Mobile Tactical Air Navigation (AMTAC) system service life and replacing the AN/TRN-47(v)1 Tactical Air Navigation (TACAN) system: The AMTAC is a trailer-based, lightweight, and highly mobile navigational aid. This system enables MATC detachments to provide a mobile Federal Aviation Administration (FAA) certifiable navigational aid at expeditionary airfields, remote landing sites, and within the National Airspace System (NAS). The AMTAC original equipment manufacturer is no longer producing or selling the AN/TRN-47 or associated repair parts. Repair support for fielded systems is limited to the remaining component parts inventory and cannibalized parts from USMC assets no longer in use. A redistribution plan has been developed to maximize the service life of these systems. Efforts have begun on evaluating off the shelf replacement options.



AN/TPN-47(v)2

**MARINE EXPEDITIONARY ENABLERS:
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G/ATOR Block I ATC Mode: G/ATOR is the material solution for the Multi-Role Radar System (MRRS) CDD. It is a three dimensional, short / medium range radar designed to detect unmanned aerial systems (UAS), CM, air-breathing targets, rockets, artillery and mortars. This effort develops and implements an ATC capability within the G/ATOR Radar. Adjustment will allow for the development and integration of ATC functionality within the software baseline, update CAC2S/CTN interface, and provide interoperability testing and address the ATC FAA certification. G/ATOR is the Program of Record and scheduled to replace the current ATNAVICS ASR capability. G/ATOR will provide MATC with a sensor that can detect low observable / low RCS UASs and CMs and provide the MACCS and/or joint force with data that enhances IFC, CID, COP, GBAD, and CUAS / CCM mission sets.

AN/TPN-31(V)7 – ATNAVICS Range Extension and Mode 5 Level 1 and 2: ATNAVICS is a Highly Mobile Multi-purpose Wheeled Vehicle (HMMWV) mounted, mobile, self-contained, tactical airport surveillance radar (ASR) and PAR system that provides air traffic services (ATS) at designated airfields and landing sites.



AN/TPN-31(v)7

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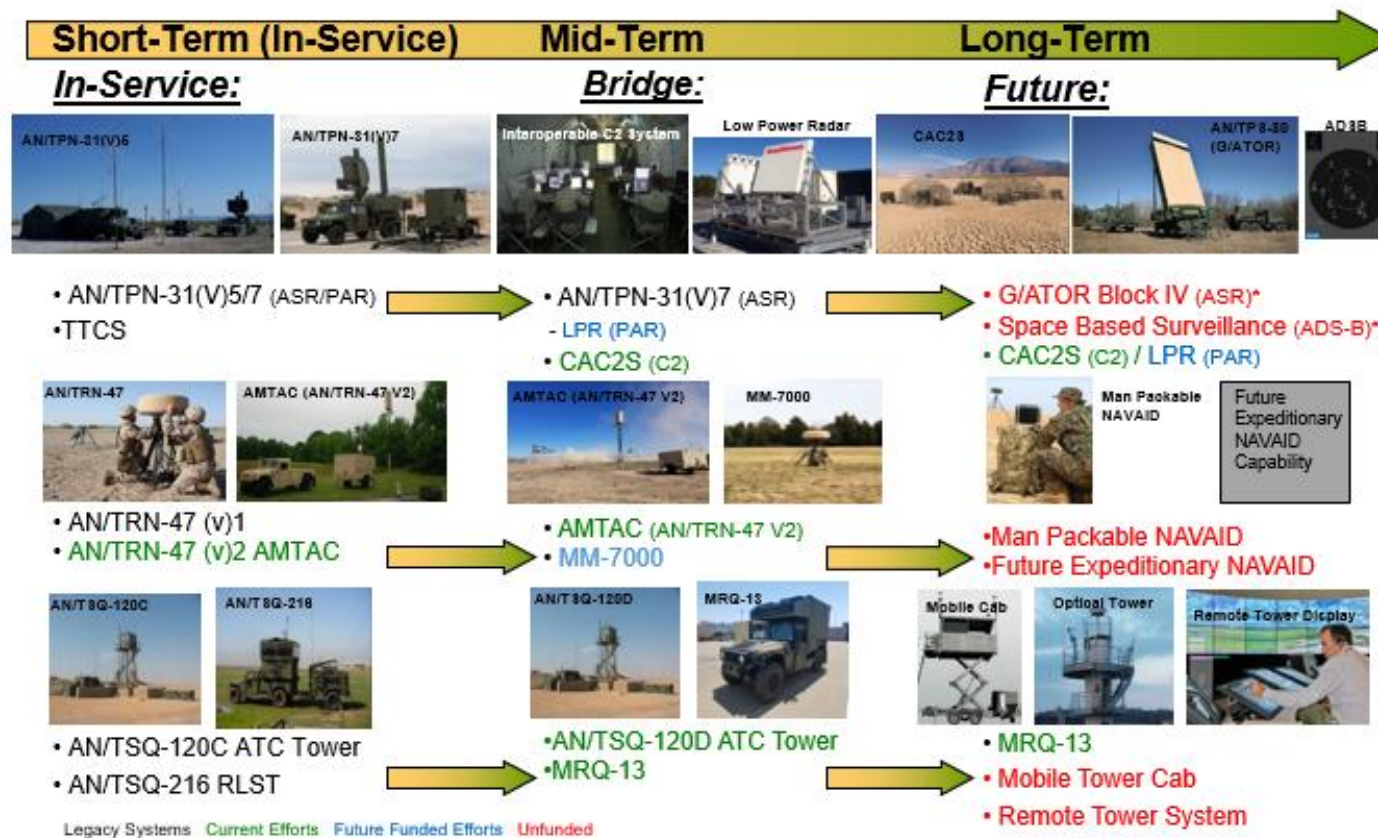


**MARINE EXPEDITIONARY ENABLERS:
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- The ASR provides primary radar coverage is up to 60 nautical miles and 60,000 feet.
- PAR coverage is up to 10 nautical miles with azimuth coverage of 30 degrees and elevation coverage of 9 degrees.
- The ATNAVICS achieves excellent target detection and tracking even in severely cluttered environments such as heavy rain or snow.

- The AN/TPX-57 has been installed to the ATNAVICS, enabling the ASR to conduct Mode 5 Level 1 and 2.

MATC Operational Support: The ATNAVICS was called upon to support multiple Navy and Marine Corps airfields to provide both ATC timeshare support and provide PAR services during outages of shore based systems, ensuring a sustained precision recovery capability. Additionally, ATNAVICS was deployed to Australia, Norway, Korea, and the Philippines where it provided PAR and Arrival control services.



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VALUE TO THE MAGTF

LAAD battalions are the Marine Corps' only capability to defend the MAGTF against UAS, cruise missiles (CM), manned fixed wing and rotary wing aircraft, and loitering munitions. LAAD's ability to defeat ISR platforms contributes to counter reconnaissance and enables stand in forces to persist inside the enemy's WEZ.

LOW ALTITUDE AIR DEFENSE (LAAD)

Today's LAAD battalions are modernizing to transition from short range man portable air defense systems (MANPADS), to an integrated, maneuverable family of systems. The Ground Based Air Defense (GBAD) Future Weapon Systems (FWS) feature expanded threat sets, are digitally interoperable, and possess a modular design able to incorporate lethality enhancements.

LAAD Funding Priorities:

- 1. Marine Air Defense Integrated System (MADIS).**
- 2. Light-Marine Air Defense Integrated System (L-MADIS).**
- 3. Medium Range Intercept Capability (MRIC).**

MARINE AIR DEFENSE INTEGRATED SYSTEM (MADIS)

MADIS employs active and passive detection methods paired with kinetic and non-kinetic defeat on a pair of complementary JLTVs to organically detect, track, ID, and engage aerial threats. Both MADIS variants will have EO/IR optics, a 30mm anti-air cannon, and an RF jammer. The MADIS Mk1 variant will turret mount the Stinger missile. The MADIS Mk2 variant integrates a 360 degree radar for low altitude surveillance and fire control against LO/LRCS threats. MADIS is designed to fill multiple capability gaps, including Counter-UAS and loitering munitions. The MADIS platform will be upgraded incrementally to ensure it remains lethal against continuously evolving threats. Future upgrades may include replacement missiles, directed energy, enhanced electronic attack, and improved sensors. MADIS leverages the Joint Counter-UAS Office (JCO) selected solutions to field technologically mature and affordable components.



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

**LIGHT-MARINE AIR DEFENSE
INTEGRATED SYSTEM (L-
MADIS)**

As part of the GBAD FWS, L-MADIS will primarily be used on MEUs and consists of mission tailored variants designed for sustained operations ashore. By reducing some of the capabilities resident on MADIS, L-MADIS is able to be integrated onto the Ultra Light Tactical Vehicle providing the MEU Commander a flexible roll-on/roll-off capability that is internally transportable in organic USMC rotary-wing aircraft.

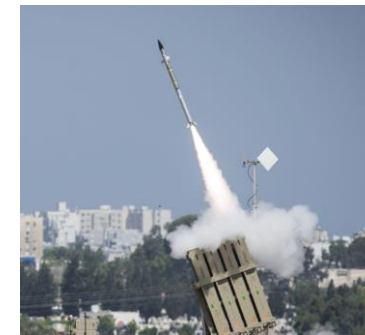
**MEDIUM RANGE INTERCEPT
CAPABILITY (MRIC)**

MRIC will defend FMF fixed and operationally fixed-sites primarily against subsonic/supersonic Cruise Missiles (CM); secondarily against other aerial threats that enter into its engagement zone. MRIC, in concert with MADIS, provides a complementary defense-in-depth. MRIC will be interoperable with joint

service IAMD capabilities, providing CM defeat not just to Marine Corps units but also the naval and joint force.

LAAD Operational Support

The proliferation of UAS employment by our adversaries has lead to multiple urgent universal needs statements resulting in fielding prototype capabilities. LAAD Marines have been called upon to operate directed energy platforms in CENTCOM resulting in multiple successful engagements. Additionally, every CONUS-based MEU is deploying with a prototype L-MADIS system, fulfilling a critical gap until Program of Record systems can be fielded.



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

METEOROLOGICAL AND OCEANOGRAPHIC (METOC)

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

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

VALUE TO THE MAGTF

METMF(R) NEXGEN represents the Marine Corps only organic meteorological capability providing critical METOC data with or without network connectivity to all elements of the MAGTF including the MMEF, MAW, and GCE. Detection and prediction of hazardous weather conditions are a critical component of the overall MAGTF/joint mission.

Current Service Life Extension Plan (SLEP) efforts focus on transitioning away from the HMMWV/Trailer mounted platform to a containerized, truly scalable, modular, and portable dual QUADCON transportable system allowing for the delivery of timely, accurate and relevant METOC products and mission impact assessments.

Program Overview

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

1. CPD-Approved Acquisition Objective (AAO): 15 modified to 14 per joint letter (CMC/APX-1, OPNAV N2/N6E) of 17 May 2013
 - 11 of 14 systems procured

- Intelligence Battalion Variant (IBV) of the METMF(R) NEXGEN program partially fielded to all three Marine Corps Intel Bns.
- Currently executing Service Life Extension Program (SLEP) to modularized and modernized capability with anticipated delivery in FY23-FY24.
- ATC Co M shortfall of (1) system for newly formed unit currently under POM consideration ~\$2.4M

2. NEXGEN supported deployments/exercises:
 - Weapons and Tactics Instructor (WTI) Course
 - Large Scale Exercises (LSE)
 - Humanitarian Aid and Disaster Relief (HADR) and Inter Agency support worldwide
 - On-going METOC support to aviation operations around the world.

Issues

1. Program has \$6.8 OMN shortfall across the FYDP 11 of 14 systems procured
 - Since POM-14, the Program identified the risk for reliance on annual execution year requests for OCO funding and had requested OPNAV to reevaluate and reprogram OCO funds to base OMN
 - 10 year reliance on OCO funding equaling approximately 28% of Programs annual OMN requirements
 - OCO removed beginning in FY22
2. Current budget profile only allows for support to 40-50% of the fielded systems and delays (V3) fielding by 24 month
 - (4) of (8) MACS (V1) systems will not be able to be supported
 - (1) of (3) IBV (V2) system will not be able to be supported
 - (1) of (1) USMC-Reserve (V1) system will not be able to be supported
 - Remaining systems will degrade over a 24 month period (FY24-26) due to delayed fielding plan for the (V3)
3. ATC Co M shortfall of (1) system for newly formed unit currently under POM consideration ~\$2.4M

AN/UMQ-4(V)4 NAVAL INTEGRATED TACTICAL ENVIRONMENTAL SYSTEM – VARIANT IV (NITES IV)

VALUE TO THE MAGTF

NITES is a set of software and hardware tools that provide METOC professionals with carry-on/carry-off capabilities to process (analyze), exploit (forecast/performance prediction), and disseminate (customer delivery) METOC information afloat and ashore.

Program Overview

AN/UMQ-4(V)4 is a legacy hardware capability under the Naval Integrated Tactical Environmental System – Next Generation (NITES-NEXT). NITES IV consists of three laptops with several peripherals, each designed to perform a different function but all loaded with the same legacy METOC software. Mission requirements, network availability, and embarkation space will dictate how best to employ the system.

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

1. System has been in continuous service by the Marine Corps since 2007.
2. (52) Processor Suites, (46) Sensor/AWOS, w/ (25) Advanced Micro-Weather Sensors (AMWS) to be fielded FY23-FY26 as replacement to AWOS
3. Supported multiple deployments/exercises
4. Technical Refresh of Processing Suites completed in FY21 next refresh FY24.

Issues

NITES-NEXT was planned to be a software-only solution with no hardware identified for mobile processing and surface sensing. The Marine Corps identified the continued need for hardware to deliver this capability until technology matures to remove this requirement.

METOC MODERNIZATION: THE WAY FORWARD

The METOC community requires significant changes across DOTMLPF to deliver a METOC capability to the FMF, 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 to support naval and joint force operations.

Initiatives

Modernization of capabilities to support information warfare:

1. FY23/24 delivery of METMF(R) NEXGEN (V3).
*possibly delayed fielding by 24 months due to FY22 loss of OCO.
2. Technical Refresh of NITES-Next Processing Suites FY24.
3. Advanced Micro-Weather Sensors (AMWS) to be fielded FY23-FY26.

Professionalization of the METOC workforce:

1. Introduction of METOC Impacts Analyst Course (MIAC).

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

**TODAY'S EXPEDITIONARY AVIATION
GROUND SUPPORT FORCE**

The Marine Wing Support Squadrons (MWSS) serve as our “maneuverable carriers ashore” and provide 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.

As the nation's force in readiness, Marines are frequently called upon to respond rapidly to an emerging crisis or strategic surprise. The Marine Corps must retain its capabilities as an agile naval expeditionary force characterized by speed, versatility and lethality.

MARINE WING SUPPORT SQUADRONS

The MWSS is built specifically to enable Marine aviation operations at the time and location of the commander's choice. Outfitted with a specifically tailored T/O and equipment set, the MWSS maintains the capability to **establish and operate three four-point FARPS**. FY 22 will see 9 active component MWSS's and 3 reserve component MWSSs manned, trained and equipped for the future fight.

There are 6 activities of aviation ground support:

AIRFIELD GROUND SUPPORT ACTIVITIES

1. Establish expeditionary aviation shore-based sites
2. Provide airfield services at expeditionary aviation shore-based sites
3. Conduct forward aviation combat engineering (FACE) operations
4. Conduct base recovery after attack (BRAAT)
5. Conduct airfield damage repair (ADR) operations
6. Conduct aircraft salvage and recovery operations

AIRFIELD SUPPORT

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

LIMITED SUPPORT

1. Essential Engineer Services
2. Medical Services
3. Motor Transport
4. Field Messing

AGS FUNDING PRIORITIES

1. Expeditionary Fuels Initiatives
2. Sustainment Lighting System
3. Expeditionary FOD mitigation equipment
4. FARP Signature Management
5. Expeditionary Fire and Rescue equipment
6. Airfield Damage Repair
7. Expeditionary Lightweight Matting
8. Airfield Survey Equipment

MARINE EXPEDITIONARY ENABLERS:

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



The Marine Wing Support Squadron is organized to conduct task-organized aviation ground support (AGS) for a Marine Aircraft Group (MAG) or other designated aviation forces by establishing and supporting contingency airfields through forward aviation combat engineering, flight line operations, forward arming and refueling points, airfield damage repair, and aircraft salvage and recovery in order to enable expeditionary aviation operations. The MWSS provides, in a limited capacity, general and combat engineer capabilities as well as limited motor transport support to a MAG, ACE, MAGTF, or other naval Force units. The MWSS can establish and simultaneously operate three, four-point FARPs. This graphic represents the baseline capability set of an MWSS.

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

AIRFIELD SUPPORT FUNCTIONS:

Expeditionary Airfield (EAF) Services

An EAF is a shore-based aviation support system that permits landing force aircraft to operate from FOBs within effective range of ground forces. An EAF is a construction concept used to develop or enhance FOBs and should not be confused with a concept of employment for Marine aviation. The EAF concept gives the ACE or site commander operational flexibility by providing a rapidly deployable, self-sustaining, and survivable forward air operating location that is designed to support the ACE during expeditionary operations. **There is approximately 3 million square feet of expeditionary airfield matting available within each MAW that can support a variety of airfield and landing zone construction efforts.**

Expeditionary Firefighting and Rescue

Expeditionary firefighting and rescue is a unique capability within the ACE that provides emergency services in support of FOBs and support installations. The primary and secondary mission of EFR is to save lives and protect property. Expeditionary firefighting and rescue is manned, trained, and equipped to provide services such as fire prevention, fire suppression and extinguishment, extrication and rescue, basic emergency

medical services, salvage and overhaul operations, and response to hazardous material incidents.

Aircraft and Ground Refueling

The ACE is responsible for bulk fuel support and daily management of bulk fuel for airfields and FARPs. The MWSS provides bulk fuel support to organizations within the boundary of the airfield, including support to other services' aircraft if directed in the theater bulk fuel plan. Each MWSS possesses the personnel and equipment to fulfill this responsibility and maintains the capability to store and distribute large quantities of bulk fuel for the ACE.

Explosive Ordnance Disposal

The EOD mission supports freedom of maneuver and force protection. It also provides the MAGTF with a critical enabling capability in the form of collection, reporting, and exploitation by providing access to terrain, installations, and facilities that would otherwise be denied to the force due to hazards associated with explosive ordnance. Explosive ordnance disposal personnel possess the capability to detect, locate, access, identify, triage, diagnose, stabilize, render safe/neutralize, recover, exploit, and dispose of weapons and explosive ordnance that threaten personnel, property, and lines of communications. This includes conventional munitions, CBRN munitions, unexploded ordnance (UXO), weapons of mass destruction, homemade explosives, and improvised explosive devices.

U.S. Marines working on the MCAGCC Twentynine Palms Strategic Expeditionary Landing Field



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

AIR FIELD SUPPORT FUNCTIONS:

Essential Engineer Services

The engineer company of the MWSS provides essential engineer services to meet the general engineering requirements of their respective MAG or an ACE. The three main categories of engineer services provided by the engineer company are general engineering services, utilities, and materials handling and heavy equipment services.

Motor Transport

The MWSS motor transport company provides light, medium, and heavy vehicle transportation in support of ACE operations. It is capable of self support and limited support to move items that are essential for ACE operations at a FOB (i.e., ordnance, personnel, fuel, and supplies and equipment), as well as wrecker support for the ACE. Additionally, it provides MAG personnel with the training necessary to become licensed to operate tactical vehicles.

Field Mess

The food services section of a headquarters and service company is capable of establishing and operating a

field mess that can feed up to 800 ACE personnel two hot meals per day. Using organic equipment, such as the expeditionary field kitchen, the MWSS can feed ACE personnel working aboard an Advanced Naval Base, as well as ACE units located at remote locations.



Medical Services

Each MWSS is structured with an organic medical section to support the ACE. The MWSS medical support section comes equipped with sufficient medical equipment and supplies to establish a flight line aid station to provide medical care to one FOB and its tenant units. In addition to routine sick call, flight line aid stations provide aviation medicine; preventative medicine; and laboratory, X-ray, and pharmacy services support. An MWSS is capable of providing Role 1 medical care.

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

**AVIATION GROUND SUPPORT MATERIEL
INITIATIVES**

EXPEDITIONARY FUELS SYSTEMS

VALUE TO THE MAGTF

The new family of fuel distribution systems reconfigures current equipment to meet current supply policy, EABO, LOCE, and Distributed Maritime Operations (DMO) concepts. The systems are scalable and components are interoperable with other services (joint capability). Each system has the capacity to support receiving, storing, transferring and dispensing/issuing fuel. The endstate is a solitary system composed of various module sizes to support aviation (MWSS), ground (ESB) missions, and meet increased MEB /MEF requirements.

System Description

The current Tactical Airfield Fuel Distribution System construct, mission, and tasks of the MWSS; fuel, equipment, and manpower requirements do not facilitate responsive and accurate fuel support. This limiting factor has identified the need for overhauling TAFDS equipment and personnel requirements that support DPG and LOCE / EABO concepts.

The following initiatives reconfigure and

modernize Tactical Fuel Systems to support to the MAGTF in future operations:



Tactical Air Ground Refueling System (TAGRS):

Prototype comprises of a Polaris MRZR D2/D4 and ultralight combat trailer with pre-installed pump, filter/separator, hose, hardware, and safety equipment. Designed to rapidly establish mobile refueling sites in remote locations to extend operational reach and time on station for rotary and fixed-wing aircraft. Capable of simultaneous refueling of two aircraft from a single fuel source and reduces aircraft time-on-deck by increasing fuel offload speed through improved pump capacity.

Expeditionary Mobile Fuel Additization Capability (EMFAC):

A skid-mounted additive injection system that injects appropriate quantities of FSII, CI/LI, and SDA to convert Jet A / A-1 to F-24 / JP-8. Provides flexible, expeditionary fuel foraging capability using small mobile teams of Bulk Fuel Marines to deliver MILSPEC fuel taken from host nation infrastructure, captured fuel, and other sources in forward, austere locations for use in aircraft, ground vehicles, and equipment.

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

**AVIATION GROUND SUPPORT MATERIEL
INITIATIVES**

EAF LIGHTING UPGRADE (FY19 TO FY22)

VALUE TO THE MAGTF

The EAF lighting upgrade is necessary to support the rapid deployment and establishment of self-sustaining airfield infrastructures in an expeditionary operating environment. The Sustained Lighting System (SLS) is capable of providing appropriate airfield lighting for day and night aviation operations in visual and instrument meteorological conditions. The new lighting system provides improved reliability through the use of green energy, and facilitates more efficient install with minimal maintenance. The endstate is SLS equipment that enables the establishment of EABs and enhances existing and emerging Marine Corps service, as well as naval and joint concepts.

System Description

Current EAF hard-wire lighting system utilizes 1960-era technology that is maintenance-intensive. We face constant logistical challenges with these systems—the parts are obsolete. We must upgrade this system.

1. The EAF program office (PMA-251) is pursuing updating the obsolete lighting system in an incremental approach by procuring an LED

MALSAR Approach Light System capable of providing CAT-1 IFR and replacing the current approach and strobe light system.



2. Further enhancements include a high-temp VTOL-taxiway light that is more energy-efficient and durable while eliminating the need for 45W constant current regulators (CCR) and transformers. An improved power and control Infrastructure with a 15kW CCR that integrates a remote control capability is also being researched.
3. Commercially available products, to replace outdated precision approach path indicators, wind cones, and signage capabilities will be explored.
4. LED technologies will be leveraged to develop and improve runway edge and threshold lights.
5. Improvements to the current expeditious minimal operating landing strip that takes advantage of green technologies is also being pursued.

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

**AVIATION GROUND SUPPORT MATERIEL
INITIATIVES**

**FAMILY OF FOREIGN OBJECT DAMAGE
(FOD) MITIGATION EQUIPMENT (F2ME)**

VALUE TO THE MAGTF

The family of FOD Mitigation Equipment (F2ME) enables the ACE to provide sortie generation and sustainment for all type, model, series and fifth generation aircraft. The equipment set extends the reach of the MAGTF by safely and efficiently removing debris from aircraft operational areas. The equipment is scalable, lightweight, and operates in both cold and hot weather environments. The endstate is F2ME provides the means to rapidly identify and remove FOD from landing surfaces to avoid fiscal burdens and provide the required level of safety.



System Description

F2ME defines the required capabilities and attributes for a family of systems to reduce/eliminate debris on aircraft operational surfaces. In 2014, USMC Aviation determined that historic FOD rates were unacceptably high and initiated an effort to research and implement process improvements; equipment, training, and technologies that would identify the root causes and mitigate FOD events. It is estimated that FOD incidents will cost the Naval Aviation Enterprise more than \$2 billion in engine replacement and repair cost over the FYDP (2019-2024) with a 10 year cost of \$4.4 billion (2019-2029). Additionally, distributed short take-off and vertical landing operations does not take into account FOD vulnerability of the F-35B engine and there is no plan for engine replacement/repair at austere sites.

The current USMC FOD mitigation capability is not configured with adequate equipment to provide the necessary support for all United States Marine Corps (USMC) and joint aircraft platforms. The proposed F2ME takes advantage of the latest equipment and innovative processes that will enable the MWSS to provide faster and more reliable services in an expeditionary environment. The proposed F2ME allows the MWSS to be more self-sufficient and responsive in the FOD mitigation process, ultimately enabling sortie generation regardless of type, model, and series of aircraft or operating environment.

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

**AVIATION GROUND SUPPORT MATERIEL
INITIATIVES**

AIRFIELD DAMAGE REPAIR

VALUE TO THE MAGTF

The ADR Kit provides the tools and materials to augment the existing equipment sets of the MWSS and ESB to repair damage to runways, taxiways, and landing zones. The equipment contained within this kit enables damage repair of spalls, epilets, and craters to provide a minimum operating strip (MOS). The endstate is the MOS can provide sortie generation until deliberate repairs can be accomplished.

System Description

The Marine Corps requires an Airfield Damage Repair (ADR) Kit capable of creating useable landing surfaces by new construction or repair of existing surfaces.

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.

With the ever-changing face of future expeditionary operations, there is an increasingly significant reliance on the aviation element of the Marine Air Ground Task Force (MAGTF).

An ADR capability that takes advantage of modern developments in construction equipment and materials is key to any expeditious preparation and/or rehabilitation of existing airfields.



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

**AVIATION GROUND SUPPORT MATERIEL
INITIATIVES**

AIRFIELD DAMAGE REPAIR

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With the ever-changing face of future expeditionary operations, there will be an increasingly significant reliance on the aviation element of the Marine Air Ground Task Force (MAGTF).

An ADR capability that takes advantage of modern developments in construction equipment and materials is key to any expeditious preparation and/or rehabilitation of existing airfields.

The Modernized ADR Kit consists of an assemblage of Commercial Off-The-Shelf (COTS) items in five 20' International Standards Organization (ISO) containers with a Compact Track Loader (CTL) and a Portable Concrete Mixer (PCM). 43 ADR kits have been fielded across the Marine Corps

ITEM	MAJOR COMPONENTS
CONTAINER 1	Compact Track Loader (CTL) w/Attachments
CONTAINER 2	Hydraulic Power Packs w/ Augers, POLs, Safety Equipment
CONTAINER 3	Rapid Setting Mortar Mix, Fiberglass Reinforced Polymer panels
CONTAINER 4	Flowable Fill Cement, Concrete Cutting Saw, Anchors
CONTAINER 5	Rapid Setting Concrete, Walk Behind Concrete Saw, Wire Containers
PORTABLE CONCRETE MIXER	Portable Concrete Mixer



Key upgrades include:

- 1) Improved lightweight and scalable FOD cover system
- 2) Upgraded tracked skid steered/loader with concrete cutting saw and additional attachments
- 3) Self-contained volumetric mixer

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

**AVIATION GROUND SUPPORT MATERIEL
INITIATIVES**

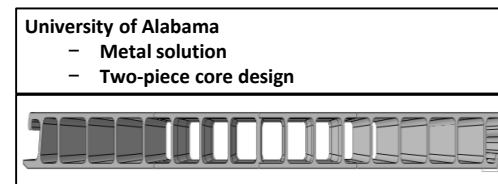
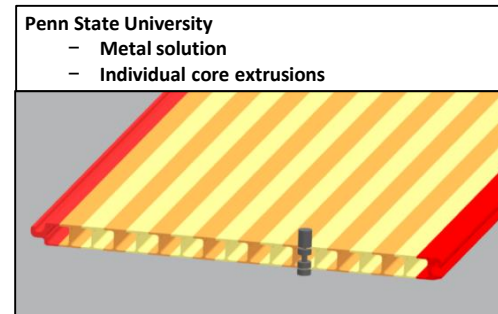
LIGHT-WEIGHT MATTING SYSTEM

VALUE TO THE MAGTF

The EAF family of equipment is necessary to support the rapid deployment and establishment of self-sustaining airfield infrastructures in an expeditionary operating environment. The Lightweight Matting System is capable of providing appropriate landing surfaces with minimal ground work (hand tools), reduced manpower, and less time than the install process of AM2. The endstate is lightweight matting enables expedient EAB establishment and provides bidirectional airfields and multiple VTOL pads.

System Description

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



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 Force Design 2030.

Specially-certified and -qualified service members and aviators, from a forward position or airborne, direct the action of combat aircraft engaged in close air support and offensive air operations; act as an extension of the TACP; and perform autonomous terminal guidance operations (TGO). These low-density, high-demand teams are sought after to support the ground fire support plan and have proven absolutely critical to mission accomplishment. Initial certification training for JTACs, FACs, and JFOs occurs through the period of instruction provided by instructors at Expeditionary Warfare Training Group Pacific and Atlantic (EWTGPAC/LANT).

The Training and Readiness (T&R) training continuum is facilitated in the fleet by air officers and SNCOs, at the artillery regiments, ANGLICOs, and divisions, who have been designated Weapons and Tactics Instructors (8077 MOS) after completing the Air Officer Course at MAWTS-1.

JTAC / FAC PRODUCTION AND SUSTAINMENT

Currently there is a validated **requirement for 344 active and reserve JTACs and 262 active and reserve FACs for a total of 606 ground-based controllers.**

This need translates to a requirement to produce 240 JTACs annually. Air support requirements for certification and qualification has grown and will continue to be more challenging. Initial certification requires 4,320 live controls for JTAC production. Annual qualification requires 1,464 live controls to maintain proficiency for 366 JTACs.

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.

TACP SUPPORT, TRAINING, AND READINESS

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, 0370 and 1803.
- Primary enlisted feeder MOSs are 0861 and 0321.
- Must be E-5 and above.
- All these MOSs are listed on Unit T/O and T/E with a billet MOS of 8002.
- 0321 and 0372 are given an additional skills designation of 8002 held outside of a billet

FORWARD AIR CONTROLLER (FAC, MOS 7502)

An **officer (aviator) member of the tactical air control party who, from a forward ground or airborne position, controls aircraft in close air support of ground troops.** The Marine Corps is the only service that uses the term, therefore in the joint community a FAC is a JTAC.

FORWARD AIR CONTROLLER AIRBORNE (FAC(A))

FAC(A)s are an airborne extension of the Tactical Air Control Party, who operate as the forward element of the Theater Air-Ground System (TAGS). JP 3-09.3 Close Air Support states that current and qualified FAC(A)s “will be recognized across the DOD as capable and authorized to perform terminal attack control”. As defined in JP 1-02, DOD Dictionary of Military and Associated Terms, a FAC(A) is defined as “a **specifically trained and qualified aviation officer who exercises control from the air of aircraft engaged in close air support (CAS) of ground troops.**”

USMC FAC(A) Platforms: AH-1, UH-1, FA-18, AV-8B

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 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.

TACP SUPPORT, TRAINING, AND READINESS

WEAPONS AND TACTICS INSTRUCTOR (WTI, MOS 8077)

A **SNCO or officer graduate of the MAWTS-1 Weapons and Tactics Instructor Course** gains the designation as a Weapons and Tactics Instructor (WTI).

A WTI has completed the transformation from an individual trained in terminal attack control to an experienced aviation integration training manager and JTAC Evaluator.

Each **Regimental and MEU Air Officer and ANGLICO Company Air Officer shall attend the Air Officer Course and be certified as a WTI.**

At the regimental and MEU level, WTIs shall supervise the development and implementation of subordinate unit collective and individual aviation integration training and shall facilitate the training and evaluation of adjacent units. (MCO 1301.25C)

Weapons and Tactics Instructors provide a capability to fill associated operator force billets to develop and execute a unit training program in accordance with the Weapons and Tactics Training Program (WTTP). This training is focused on achieving individual training and readiness through collective operational unit training.



MARINE TACTICAL AIR CONTROL PARTY

FAC Requirement

Unit Type	Distribution	A/C	R/C
Infantry Bn	24 A/C Bn 8 R/C Bn	72	27
LAR Bn	3 A/C Bn 1 R/C Bn	9	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)	33
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		178	75

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	6/ Inf Bn	144	54
LAR Bn	1/Plt	27	18
Artillery	3/FO Team	216	42
	2/NGF Liaison Section	12	N/A
	HQ BTRY (LAR)	40	N/A
Force Recon/ Recon	1/Team	111	60
ANGLICO	24/ Co	72	108
TOTAL		622	282

FAC(A) Requirement

Unit Type	Distro	CMMR	FAC(A)
HML/A	6 Sqdn 1 R/C	9 FAC(A) per Sqdn	54 (9)
VMFA F/A-18	5 Sqdn	3 FAC(A) crews per Sqdn (Two per aircraft: 6 total)	30
*VMFA F-35	6 Sqdn	2 FAC(A) per Sqdn	12
*VMA	2 Sqdn	2 FAC(A) per Sqdn	4
TOTAL			84 (9)

* FAC(A) is a Core + MET for F-35 and AV-8, not denoted in total.

Total TAC: 690 (528 AC / 162 RC)

MARINE COMMERCIAL AIR SERVICES PROGRAM

Marine Corps aviation has an increased demand in three areas:

- 1. Aggressor air-to-air (adversary) training**
- 2. Close air support aircraft**
- 3. Air-to-air refueling**

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

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

- 1. Fighter jets with similar or better capabilities to USMC F-5s** providing fixed-wing adversary support to fixed- and rotary-wing squadrons, LAAB and command and control training.
- 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.
- 3. Refueling aircraft** to provide Marine aviation assets with an aerial refueling capability similar to that of DoD strategic assets.

The Marine Corps F-5 fleet has a service life plan that begins divestiture of current platforms in 2028.

Marine aviation is working to determine future adversary requirements and to conduct analysis on future government and vendor operated solutions. The DoN adversary solution will require a solution for the increase in adversary demand and an investment in upgraded capability to represent modern and future adversary threats.

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

The current configuration and future upgrades to the F-5 do not meet all of the 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 will provide additional organic adversary resources and expand capacity. Headquarters Marine Corps Aviation continues to assess global fighter procurement opportunities and vendor capabilities to ensure that future adversary and close air support training requirements are supported.

MARINE AVIATION TRAINING SYSTEMS (ATS)

CRITICAL ISSUES: RANGE CAPABILITY, CONTINUED

ATS DESCRIPTION

Today's dynamic operational environment requires Marine Aviation to focus its training more effectively and efficiently in order to sustain the highest levels of combat readiness. ATS integrates Marine Aviation training processes and structures into a single, unified, and holistic system that spans all aviation communities. ATS is a completely integrated training system that links training cost with readiness in order to provide the Marine Air-Ground Task Force (MAGTF) commander with combat-ready units.

ATS SCOPE

ATS integrates and coordinates policy, manpower, equipment, facilities, and fiscal requirements of post-initial accession training for Marine Aviation officers and enlisted personnel. The system also integrates initial accession aircrew training (Core Skill Introduction) for aviation units that conduct platform specific aviation training (for example, the Fleet Replacement Squadron [FRS] for the MV-22 aircraft). ATS concepts, processes, and programs are applicable to all current and future Marine Aviation training programs, including naval and/or joint programs in which Marine Aviation participates.

ATS FOCUS

ATS will integrate concepts, processes, and programs for training that will institutionalize operational excellence reflected in increased combat readiness, decreased costs of training, and preservation of personnel and assets. ATS seeks to provide a current, responsive, holistic, and relevant training system for aircrew, aircraft maintenance, aviation ground support, and aviation C2 personnel. The training system includes curriculum, courseware, and training devices.

ATS also strives to maintain relevant and concurrent equipment/platform training through Systems Approach to Training (SAT) derived curricula and improved use of Operational Risk Management (ORM), Crew Resource Management (CRM), and Risk Resource Management (RRM) as methods used to manage and mitigate risks through its Marine Aviation Training System Sites (MATSS) located aboard Marine Corps Air Stations (MCAS) to assist in facilitating the ATS program.

PROCESS

Training Management occurs through the use of tools and processes that provide a common training experience across the ATS, regardless of station, platform, and/or system. Elements that support the management and integration of training information are Training Management Process (TMP) and Marine Corps Aviation Learning Management System (MCALMS). The TMP provides an effective forum for the operating forces to identify their training issues as the impetus for requirements generation. The TMP determines common solutions to training issues, eliminating redundant "stovepipe" solutions that are wasteful and inefficient. MCALMS is the method of delivery for academic courseware that allows for record keeping of completion across multiple communities/platforms.

Flight Leadership Standardization and Evaluation (FLSE) is a process of training toward and achieving certifications, qualifications, and designations with objective assessment of individual and instruction program effectiveness under ATS. FLSE training and evaluation supports commanders by integrating and improving existing flight leadership, combat leadership, Naval Aviation Training and Operating Procedures Standardization (NATOPS), and NATOPS instrument programs. Standardization of training systems is facilitated by managing the concurrency of training systems with equipment and aircraft used by Aviation Marines. Accomplished through several processes of acceptance of training courseware and devices. Risk management and mitigation is controlled through awareness training (i.e., Risk Management).

MARINE AVIATION TRAINING SYSTEMS (ATS)

PROCESS Continued

Advancements in training devices allow for expansion of experience through exposure to real world scenarios, and require aircrew to exercise risk management skills without exposing the aircrew or aircraft to undue hazards and risks of actual loss. The MATSS provides a venue that supports the instruction of the academic portions of risk management, aviation safety programs, and Training and Readiness (T&R) prescribed training by experienced instructors. All facets of training, basic, operational, safety, standardization, and risk management are integral foundations of ATS and their principles are reinforced during all phases of training.

MARINE AVIATION TRAINING SYSTEM SITES (MATSS)

Implementation and operational control of ATS occurs at each Marine Air Wing (MAW). It is the management efforts by each MAW that ensures its units have those tools necessary to accomplish prescribed training. The management of resources includes military, civilian, and contractor instructional services, simulator and training device operations and maintenance, learning and training management systems, academic courseware (to include Revision and Maintenance [R&M]), electronic classrooms, and appropriate physical and/or cybersecurity requirements.

The MATSS facilitates simulator and academic resource use, standardization and evaluation, and training relevant and responsive to fleet needs. With increased USMC and joint-level awareness for ATS, leveraging common solutions across the various platforms, communities, and services will result in significant cost savings, enhanced cross-functional/cross-service training, increased combat readiness, and cost avoidance/savings in training the Aviation Combat Element (ACE) and MAGTF.

ATS SIMULATORS

Simulators are specifically designed to train aircrew, maintenance, and Command and Control (C2) Marines in the execution of Training and Readiness (T&R) events.

Pilot simulators are categorized as: Aircrew Procures Trainers (APT), Flight Training Device (FTD), Containerized Flight Training Device (CFTD), Weapons Systems Trainer (WST), Tactical Operational Flight Trainer (TOFT), Full Flight Simulator (FFS), Full Mission Simulator (FMS), Pilot Training Aid (PTA), Deployable Mission Rehearsal Trainer (DMRT), Mission Rehearsal Trainer (MRT), and Cockpit Procedures Trainer (CPT).

Enlisted Aircrew (EAC)/Crew simulators are categorized as: Fuselage Trainer (FuT), Observer Training Aid (OTA), Marine Common Aircrew Trainer (MCAT), Harvest Hawk (H/H) Fires Trainer.

Maintenance simulators represent various aircraft systems and components particular to each Type Model Series (TMS) aircraft platform. Examples of these systems are fuel, oxygen, landing gear, communications, navigation, electrical, hydraulic, flight control, and landing gear, etc.)

MARINE AVIATION SIMULATOR GROWTH

In 2005, Marine Aviation had:

- 31 Pilot simulators
- 0 Enlisted aircrew/crew simulators
- 24 Maintenance simulators/training devices

In 2021, Marine Aviation had:

- 113 Pilot simulators
- 17 Enlisted aircrew/crew simulators
- 47 Maintenance simulators/training devices

In the 2022-2030 timeframe, Marine Plans to add and additional:

- 24 Pilot simulators
- 2 Enlisted aircrew/crew simulators
- 10 Maintenance simulators/training devices

New devices will be added as well as replacing older devices (e.g., CH-53K for CH-53E). Additional the ongoing effort of modernization/upgrading devices to match platform/equipment warfighting capabilities. Noteworthy is the incorporation of deployable trainers, shifting focus to battle management, combat situational awareness, and coordinated engagement/fires rather than on basic flight skills.

MARINE AVIATION TRAINING SYSTEMS (ATS)

MARINE AVIATION SIMULATOR GROWTH CONTINUED

Additionally, is the review of emerging and maturing applied sciences in the field of Virtual Reality (VR), Augmented Reality (AR), and other enabling technologies for Pilot, EAC/Crew, and Maintenance Marines. Seeking to leverage these capabilities in initial accession, intermediate training, and advanced follow-on trouble-shooting, and advanced warfighting scenario training.

We have moved away from older motion-based simulators and invested heavily into graphics and other means (i.e. tilting and vibrating seats) to stimulate vestibular organs to replicate aircraft motion, aural (i.e., sound) mimicking for aircraft and environmental noise when/where feasible.

Force Design has forced Marine Aviation to re-evaluate training system/device laydowns and composition to best train Marines taking advantage of varying fidelity and device capabilities. An example of this is the relocation of some devices from one location to another to support testing and advanced warfighting. Plans are in work to relocate devices to MCAS Yuma (1 AH-1Z, 1 UH-1Y, 1 CH-53E, 2 MV-22B/C, 1 MCAT) to support testing and flight operations at VMX-1 and to support Weapon Tactics Instructor (WTI) courses and Tactics Techniques and Procedures (TTPs) validation and development at MAWTS-1.

NETWORKING 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:

- CONUS bases: one section of networked simulators
- OCONUS and reserve bases: minimum of one TMS simulator
- Marine Aviation Common Synthetic Training Area (CSTA) for virtual geo-location and entity conformity for interoperability
- Tactical Environment (TEen), A Semi-Automated Force (SAF) generator, one per flight device: threat, emitters, emissions, weapon fly-outs, USMC and joint air/ground interoperability

- Common hardware approach (Gateway for networking) across all TMS platforms and community simulators to ensure a high fidelity, cross domain, platform and community distributed mission networked training capability, and lastly interoperability with Marine Air Ground Task Force (MAGTF) and joint service devices. Developed IAW current and/or draft platform/community T&R manuals, Maneuver Description Guides (MDG), and NATOPS manuals

AVIATION DISTRIBUTED VIRTUAL TRAINING ENVIRONMENT (ADVTE)

Fielded in March of 2013 across 2nd and 3rd Marine Aircraft Wings (MAW) Marine Aviation Training System Sites (MATSS). ADVTE is a closed-loop, encrypted, virtual training environment.

ADVTE will be enhancing and modernizing capabilities at 2nd and 3rd MAWs and expanding networking capabilities into 1st MAW and 4th MAW sites. This will bring together all identified aviation platform assets located throughout the Marine Corps.

Additionally, ADVTE is interoperable with the Air Force's Distributed Mission Operation Network (DMON) and has linked devices between the two services during several VRUTAL FLAG Training Events/Exercises. Discussions and efforts are underway to provide connectivity and interoperability to the Navy Common Training Environment (NCTE) at various levels of classification in support of the Commandant's and Chief of Naval Operations' edicts to conduct naval training (i.e. Expeditionary Advanced Base Operations [EABO], Littoral Operations in a Contested Environment [LOCE], and Distributed Mission Training [DM]). Additionally, efforts have been underway to connect/network to Marine Corps ground simulations/devices to conduct Marine Corps Training Events/Exercises as a MAGTF.

LIVE, VIRTUAL, AND CONSTRUCTIVE (LVC))

The purpose of LVC is to enhance fleet training with the added capability of advanced warfare and combines/collaborative operations

MARINE AVIATION TRAINING SYSTEMS (ATS)

LIVE, VIRTUAL, AND CONSTRUCTIVE (LVC) CONTINUED

Marine Corps LVC:

LVC training combines any of the three training domains (Live, Virtual, and/or Constructive) to create a common battlefield or environment, by which individuals/units can seamlessly interact across the LVC domains as though they are physically co-located together in the same battlespace.

LVC Definitions

- Live simulation – involves real people operating real systems. Military training events using real equipment are live simulations. They are considered simulations because they are not conducted against a live enemy. Example: Instrumented aircraft flying on a training range
- Virtual simulation – involves real people operating simulated systems. Virtual simulations inject human-in-the-loop in a central role by exercising motor control, decision skills, or communication skills, usually involving realistic 2D or 3D visualization. Example: Aircraft simulator
- Constructive simulation - includes simulated people operating simulated systems. Real people stimulate (make inputs) to such simulations, but are not involved in determining the outcomes. A constructive simulation is a computer program. Example: Semi-Automated forces (SAF), Computer-Generated Forces (CGF), or Artificial Intelligence (AI)

Marine Aviation LVC:

- The Marine Aviation's Aviation Distributed Virtual Training Environment (ADVTE) consists of Local Area Networks (LANs) and Wide Area Network (WAN) infrastructure and Network Exercise Control Center (NECC) configuration items that links all USMC aircrew simulators into an integrated networked training environment.
- ADVTE increases combat readiness by utilizing high-fidelity networked simulators to support Training and Readiness (T&R) and LVC training. LVC will be filling some of the gaps and seams of traditional training. Paradigm shift of the aviation training concept by leveraging simulators and increase device capability to generate readiness (T&R codes and scenario-based

training).

- ADVTE Improves flight safety and tactical mission training in highly complex and advanced scenarios which also incorporate Crew Resource Management (CRM) in networked training
- ADVTE allows for complex multi-platform and site aircraft platform simulators to “fight together” in the same battlespace environment

Marine Aviation is working with Commander Naval Air Forces (CNAF), Fleet Forces Command (FFC), and Naval Air Systems Command (NAVAIR) to develop the capability that links Live (L) aircraft on ranges to Virtual/Constructive (VC) aircraft simulators in the same virtual range environment to present a larger, more complex fighting force operating in the LVC environment with complementary assets and capabilities. The emphasis to invest in 21st century aviation training capabilities that will integrate 5th Gen and 4th Gen training and mature the LVC interoperability technologies (i.e., Multi-Level Security [MLS] and Tactical Combat Training System [TCTS]/Air Combat Maneuvering Instrumentation [ACMI]). This requires the ability for advanced data and voice exchange between aircraft and simulators utilizing innovative communication technologies to achieve a truly collaborative training environment.

MARINE CORPS AVIATION RANGES

TOWNSEND BOMBING RANGE (TBR):

The Marine Corps' newest aviation range, TBR, is the premier East Coast air to ground training range, encompassing almost 34,000 acres located in Coastal Georgia approximately 82 miles from Marine Corps Air Station (MCAS) Beaufort. TBR serves as the primary training range for the Marine Aviation's Joint Strike Fighter, the F-35 LIGHTNING II, School House, Marine Aircraft Group (MAG) 31, Second Marine Air Wing (2 MAW), and various Army, Navy and Air Force units. The range training capabilities include inert gun/cannon, rockets, General Purpose (GP) bombs, and advanced (Global Positioning System [GPS] and Laser) precision munitions such as Joint Direct Attack Munitions (JDAM) and Laser Guided Bombs (LGB). TBR provides an East coast capability to accommodate a limited advanced weapon deliveries and tactics, normally requiring deployment to West Coast Ranges.

MARINE AVIATION TRAINING SYSTEMS (ATS)

MARINE CORPS AVIATION RANGES CONTINUED

YUMA TRAINING AREA (YTA):

YTA range is the Marine Corps' premier aviation range, located in Southwestern Arizona and encompassing some several million acres. The vast size of the YTA's airspace and underlying range impact/target and maneuver areas, permitting the utilization of the latest weapons and tactics, allow Marines and other aviators to ability conduct training in the way they will fight. MCAS Yuma supports 80 percent of Marine air-to-ground training and is home to the Marine Corps Weapons and Tactics Instructor (WTI) course.

MARINE AVIATION ELECTROMAGNETIC WARFARE (EW) TRAINING:

Marine Aviation is reliant upon the Navy to provide Electromagnetic Warfare (EW) training. The Navy through their Mid Atlantic Electronic Warfare Range (MAEWR) and South West Tactical Training Range (SWTTR) range EW training programs provide the resources and equipment necessary to conduct EW training. Aviation EW consists of replicating/simulating threat systems and capabilities, utilizing the Radio Frequency (RF) spectrum in which to acquire, track, target and engage aircraft. This capability requires the greatest level of fidelity/expertise in replicating the representative signals and processes that these threat systems operate, allowing aviators to experience the challenge of being engaged and train to survive/defeat the threat.



Currently TBR and YTA rely upon and work efforts in conjunction with MAEWR & SWTTR programs to leverage advances in technologies (e.g. miniaturization, electronics, computer chip sets/circuits, etc.) to provide EW training.

As technology investments are made, replacing outdated threats with more tactically relevant and current threat presentation systems, and in conjunction with advancements in aircraft instrumentation (i.e. TCTS, TCTS Inc II/ACMI) provides Marine Corps, Navy, and Air Force aviators with better training against more advanced threat systems. Marine Aviation works these efforts in coordination with Training And Education Command (TECOM) Range and Training Area Management (RTAM) Branch, Naval Aviation Training Systems and Ranges Program Office (PMA-205), Fleet Forces Command (FFC), and Commander Naval Air Forces (CNAF) .

MARINE AVIATION TRAINING SYSTEMS (ATS)

CHIEF OF NAVAL AVIATION TRAINING (CNATRA) AIRCRAFT

Contrary to popular assumptions, the Marine Corps does procure a significant portion of CNATRA aircraft platforms in a joint naval strategy with the Navy to support undergraduate flight training.

Naval Undergraduate Flight Training Systems Program is where student pilots and Undergraduate Military Flight Officers (UMFOs) acquire mission-critical aviation skills necessary to carry out current and future missions of the United States Navy and Marine Corps.

Naval Undergraduate Flight Training Systems consists of six trainer aircraft. These aircraft and programs also include related simulator suites, academic materials, computer-based training integration systems, and Contractor Logistics Support (CLS).

The mission of these aircraft are to train Navy and Marine Corps pilots and UMFOs.

T-45 Goshawk

The T-45A aircraft, is used for intermediate and advanced portions of the Navy/Marine Corps pilot training program for jet carrier aviation and tactical strike missions. The T-45 training system has an integrated training system that includes aircraft, operations and instrument fighter simulators, academics, and training integration system. There are two versions of T-45 aircraft in use: the T-45A (Analog cockpit version) and T-45C (Glass cockpit version).

TH-57 Sea Ranger

The TH-57 aircraft provides for training in helicopter flight operations and advanced Instrument Flight Rules (IFR) training . The TH-57 will sundown in the 2022-2024 timeframe.

T-6A Texan II

The T-6A Texan II is one component of the Joint Primary Aircraft Training System (JPATS) along with simulators, computer-aided academics, and a Training Integration Management System (TIMS).

TH-73A Thrasher

The TH-73A is the aircraft portion of the Advanced Helicopter Training System (AHTS). AHTS brings the training tools needed to produce the next generations of Rotary and Tilt-rotor pilots for the Marine Corps with current and relevant training platforms.

The TH-73A improves pilot training and skills by using current cockpit technologies and modernized training curriculum that reflect the capabilities in the current Marine Corps inventory. The TH-73A is expected to phase into service in the 2022-2024 timeframe.

T-44A Pegasus

The T-44A aircraft is used for advanced turboprop aircraft training and for intermediate E-2/C-2 (carrier-based turboprop radar aircraft) training. The T-44 is equipped with deicing and anti-icing systems augmented by instrumentation and navigation equipment to allow for flight under instrument and icing conditions.

**MARINE CORPS AVIATION
MILITARY CONSTRUCTION PLAN**

Effective aviation facilities portfolio management is essential to achieve the Commandant's vision for Marine Corps Aviation. This portfolio includes operation, sustainment, and repair of existing facilities, Military Construction (MILCON) for major new facilities construction, and Host-Nation Funded Construction by our allied partners. It also includes disposition and demolition of excess and end-of-life facilities.

A philosophical change has occurred from purpose-built facilities for specific systems, to standardized facilities which focus on flexibility and commonality, with reduced complexity. This enables agility in unit laydown and deployments to serve emergent MAGTF requirements. This modular approach to garrison air support reduces dependence on specific home-basing locations, reduces construction and sustainment cost, improves resiliency, thereby multiplying Marine aviation's power projection capability.

HQMC Aviation Sustainment Branch provides subject matter expertise and engagement to advance projects from initial concept through planning, prioritization and funding. This enables timely completion, within budget and other constraints. MILCON is a strategic appropriation, requiring per-project congressional approval, and 5 to 7 years from initial requirement identification to construction completion. The resultant facilities will support Marine aviation for a likely 50+ year lifespan.

Capable facilities are a readiness and power-projection enabler, fulfilling an essential role within the National Defense Strategy. Our focus includes new platform introduction and integration of advanced warfighting capabilities across the MAGTF. Key AVPLAN enabling projects are shown at right, representing a high priority subset of the total MILCON program.

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MCI - PACIFIC

MCAS Kaneohe Bay
FY23 P#TBD BRAVO RAMP RENOVATION, FORCE DESIGN (*)
FY23 P891 HANGAR 102 UPGRADES MQ-9A, FORCE DESIGN (*)
FY24 P#TBD KC-130J OPERATIONAL SUPPORT FACILITIES (*)
FY25 P#TBD TYPE-II HANGAR, FORCE DESIGN
FY28 P948 MALS-24 MAINTENANCE FACILITY

MCAS Iwakuni
FY25 P1001 MAINT HANGAR IMPROVEMENTS #3 (*)
FY26 P#TBD F-35 OPERATIONAL TRAINER COMPLEX MODERNIZATION (*)
FY26 P#TBD MAINT HANGAR IMPROVEMENTS #4 (*)

MCI - WEST

MCAS Miramar
FY23 P201 F-35 AIRCRAFT MAINTENANCE HANGAR B
FY23 P254 F-35 CENTRALIZED ENGINE REPAIR FACILITY (CERF)
FY24 P268 CH53K SIMULATOR FACILITY
FY25 P202 F-35 AIRCRAFT MAINTENANCE HANGAR C

MCAS Yuma
FY26 P#TBD UAS MISSION SUPPORT FACILITY, FORCE DESIGN

MCAS/MCB Camp Pendleton
FY25 P137 AVN CORROSION CONTROL FACILITY
FY26 P135 AVIATION PRESERVATION WAREHOUSE

MCI - EAST

MCAS Cherry Point
FY24 P226 MALS 14 MAINTENANCE FAC / MAG14 HQs
FY25 P200 F-35 HANGAR (2 MODULES)
FY25 P206 F-35 APRON IMPROVEMENTS
FY25 P258 2ND LAAD BATTERY MAINTENANCE AND HQ
FY26 P260 KC-130J FUSELAGE & WEAPONS SYSTEM TRAINERS #2 (*)

MCAS Beaufort
FY26 P#TBD HANGAR 418 RENOVATION - UAS (*)
FY26 P#TBD TOFT FACILITY RENOVATION - UAS (*)
FY27 P475 TYPE I AIRCRAFT HANGAR

MCAS New River
FY27 P666 TYPE II REPLACEMENT HANGAR

Notes

- (*) indicates projects which may potentially be funded by Unspecified Minor Construction or Operations and Maintenance appropriations. Exact appropriation varies by project.
- Dates reflect project program year, typically year of construction start. Milcon planning timelines are typically 2 years accelerated compared to non-Milcon appropriations.
- The projects listed are required to achieve the current AvPlan or to correct other deficiencies. The information represents a snapshot in time, and is subject to change.
- Construction completion schedules vary based on project type, but are typically 2 to 3 years after project program date.





L-MADIS provides both kinetic and non-kinetic defeat capabilities to destroy or negate aerial threats in support of the MAGTF.



CVW-17 commanding officer flies on the wing of a Marine Corps Hornet over Iraq in support of INHERENT RESOLVE, November 2020. Both aircraft launched from, and recovered aboard, USS *Nimitz*.





VMFA 314

MARINES

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*A U.S. Marine Corps Grumman F6F-5N Hellcat of VMF(N)-511 is launched from the deck of the escort carrier USS Block Island (CVE-106) off Okinawa on 10 May 1945. Mechanics dubbed this aircraft the "Hangar Queen" because it had been "down" several times in one week for minor repairs. Here, "Hangar Queen" is about to head for Sakashima in support of the Okinawa campaign. The catapult officer in the foreground resembles a baseball umpire calling a strike on the Japanese by launching this plane.
10 May 1945
Pfc. Harvey M. Uribe, USMC*

Source U.S. Navy National Museum of Naval Aviation photo No. 1996.253.7190.001



U.S. Marine Corps Aviation