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# CAMP

# CORE VIONICS MASTER PLAN

# 2012

Aviate

Navigate

Communicate

Network

Survive

# Endorsement and Distribution

PMA209, Air Combat Electronics, hereby promulgates the 2012 Core Avionics Master Plan (CAMP 2012). This document is co-sponsored by PMA209 and PMA272, Advanced Tactical Aircraft Protection Systems. PMW/A170, Communications Office (including Air Navigation Warfare), PMA213, Air Traffic Management Systems and PMA281, Strike Planning and Execution Systems, also contributed relevant avionics system information. It presents recommended practices, roadmaps and detailed explanations of evolving avionics-enabled capabilities designed to provide platform managers with situational awareness that can help them build effective Flight Plans and efficient budget submission strategies.

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# Core Avionics Master Plan

## Executive Summary

**Objective.** A significant portion of Naval Aviation's forces future tactical advantages will be achieved through innovative improvements to digital information processing and networked exchanges enabled by avionics. Given the current fiscal environment, it is more critical than ever to maximize such warfighting capability gains by reducing the costs of fielding and sustaining these systems. The 2012 Core Avionics Master Plan (CAMP) is promulgated by PMA209, Air Combat Electronics, in support of the Naval Aviation Enterprise (NAE) mission – ***"Advance and sustain Naval Aviation warfighting capabilities at an affordable cost… today and in the future."*** It is co-sponsored by participating commodity management program offices, including: PMA213, Air Traffic Management Systems; and PMA272, Advanced Tactical Aircraft Protection Systems. PMW/A170, Communications Office (including Air Navigation Warfare), and PMA281, Strike Planning and Execution Systems, also contributed relevant avionics system information. The CAMP presents recommended practices across requirements, resourcing and acquisition management that promote affordability through leveraging, economy of scale, expansion of benefits across multiple users through commonality, faster delivery of new or enhanced warfighting capabilities through open architectures, improved sustainment and reduced logistics footprint in support of expeditionary operations. Appendices to this document include capability evolution roadmaps that portray the progressive enhancement of avionics systems warfighting contributions over time. Operational and programmatic compliance mandates are referenced for Navy and Marine Corps program managers to use in tailoring their platform Flight Plans.

**Core Avionics.** Core avionics encompass those systems that provide the core set of functionalities that are fundamental to aviation. Their contributions can be organized into the following capability areas:

- Information Management – planning, processing, encryption, display
- Information Exchange – voice, data, imagery, video, tactical networks
- Navigation – position, velocity, altitude, attitude and time (en-route and approach)
- Cooperative Surveillance and Combat Identification – battle-space management
- Flight Safety – collision/terrain avoidance, parameter recording, health monitoring
- Self Protection – threat sensors and defensive countermeasures

**Recommended Practices.** Naval Aviation development, procurement and sustainment resources are becoming increasingly limited. Resources spent on duplicative system development efforts, independent modernization of unique solutions and redundant logistics infrastructures reduce the overall warfighting capability that can be provided to the Combatant Commanders. Stove-piped uniqueness of systems with like functionalities results in competition between platforms for funds to cover the same incremental improvements. Expeditionary forces need to reduce deployment footprints to remain agile and increase cross-platform interoperability. Commodity-based program offices, requirements officers and resource managers have been purposefully established across the NAE to capture efficiencies by optimizing centralized management and commonality in product solutions. Recommended best practices described in this document are intended to achieve efficiencies across the three principal NAE management arenas. Each of the recommended processes is built upon existing formal instruction guidance or policy.

# Core Avionics Master Plan

## Requirements:

- Use the USN Naval Aviation Requirements Group (NARG) and USMC Operational Advisory Group (OAG) processes to identify and prioritize core avionics requirements according to collective need and benefits.
- Where possible, leverage existing Service or Joint capability documents to accelerate formal requirement establishment.
- Use commodity capability evolution roadmaps and platform flight plans to align the timing of pursuit and integration of avionics-based capabilities across platforms.
- Define requirements in terms of warfighting capabilities necessary to accomplish a platform mission in support of Combatant Commander strategic objectives.

## Resourcing:

- Use road-mapping processes to conduct cross-platform and commodity office exchanges to enable collective resourcing for broader benefits.
- Ensure issues with application across multiple platforms are coordinated with commodity program offices, OPNAV N98 and HQMC APW73.
- Utilize alternative avionics resourcing opportunities between Program Objective Memorandum (POM) budget cycles, including:
    - Logistics Engineering Change Proposals (LECPs)
    - Value Engineering Change Proposals (VECPs)
    - Mid-year reprogramming
    - Supplemental funding

## Acquisition:

- Prominently factor commonality, standardization, interoperability, supportability and affordability during development of new capability solutions or enhancements.
- Leverage established solution development, maturity and lessons learned. Coordinate deliberate convergence toward common products/families of systems.
- During program baseline assessments, use the NAVAIR Commonality Opportunity Review Process (CORP) process to analyze alternative solution logistics footprints, modernization costs and sustainment life cycle cost and support impacts. Base assessments on the impacts to the entire Enterprise rather than to just the individual platform.
- Employ Open Systems Architecture (OSA) in hardware and software designs. Adhere to collective interoperability standards and protocols in order to control future modification costs. Design future platforms and evolve current platform processing architectures toward a FACE (Future Airborne Capabilities Environment) Open Application Interface configuration that allows systems and software to be integrated without requiring full mission profile regression testing.

- Ensure that Performance-Based Acquisition and Logistics (PBA, PBL) contracts can effectively and affordably leverage common product upgrade opportunities, whether they involve Government or other vendor Commercially Furnished Equipment. Work to eliminate unique interfaces and proprietary ownership.
- Consider using PMA209's government based Avionics Capability Integration Support Team (ACIST) as an alternative to the prime vendor for Lead System Integrator (LSI) activities involving avionics systems.
- Establish pro-active sustainment teams to anticipate and mitigate obsolescence and Diminishing Manufacturing Sources and Material Shortages (DMSMS) operational impacts and cost burdens.

**Application and Utilization.** CAMP 2012 is intended to be used as a tool by all platforms and other commodity capability providers across Naval Aviation. The recommended practices do not diminish Program Manager (PM) authority. It is understood that the efficiencies and benefits of commonality and centralized management do not always present the best acquisition strategy. Unique solutions should be pursued when there are operational imperatives that require immediate individual capability fielding, as determined by OPNAV and HQMC. They may also be appropriate if the single platform force level warfighting contribution gains justify the increased costs of independent life cycle sustainment, or the loss of potentially broader Enterprise benefits.

The roadmaps and accompanying narratives are intended to provide platform offices situational awareness of avionics enabled capability growth and expected time of maturity. The descriptions are high level, but should provide enough detail to enable the reader to determine relevance for their particular mission sets. In order to achieve these objectives, leaders across Naval Aviation requirements, resourcing and acquisition are strongly encouraged to employ the processes and strategies described in this document.

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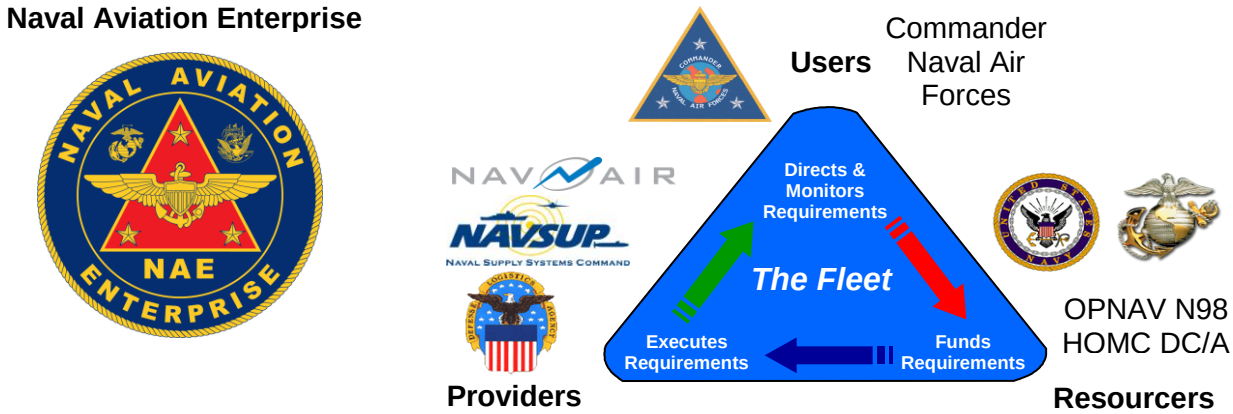
# Core Avionics Master Plan

## I. INTRODUCTION.

The 2012 Core Avionics Master Plan (CAMP) is promulgated by PMA209, Air Combat Electronics Program Manager (PM) for Naval Aviation, in support of the Naval Aviation Enterprise's (NAE) mission – ***"Advance and sustain Naval Aviation warfighting capabilities at an affordable cost… today and in the future."***. It is co-sponsored by participating commodity management program offices, including: PMA213, Air Traffic Management Systems; and PMA272, Advanced Tactical Aircraft Protection Systems. PMW/A170, Communications Office (including Air Navigation Warfare), and PMA281, Strike Planning and Execution Systems, also contributed relevant avionics system information.Managers are strongly encouraged to apply practices recommended in this plan during requirements generation, development of acquisition strategies, and preparation of resourcing requests.

The CAMP is designed to serve as a strategic planning tool to promote awareness of enhanced warfighting contributions enabled by evolving avionics systems. It identifies higher authority compliance mandates, systems inter-dependencies and advancing technological opportunities that program managers can leverage when developing their platform and weapons systems capability roadmaps or flight plans.




**NAE Leadership relationships.**

## II. OBJECTIVE.

Naval Aviation is at a crossroads with respect to affordability of technological advancements and capability evolution. Every possible efficiency must be achieved to maximize our ability to procure desired future force structure and simultaneously maintain current inventory operational readiness and relevance. Aircraft warfighting capability enhancements are increasingly dependent upon the platform's avionics architecture, which directly affects its ability to rapidly and affordably modify hardware and software. Platform interoperability is critical to enabling Naval Aviation forces to collaboratively perform Joint Operations in support of Combatant Commander objectives. With the high costs associated with modern software-driven digital systems, we can no longer afford to independently modify or logistically manage multiple unique systems that deliver similar functions. The 2012 Naval Aviation Vision's principles of platform Type/Model/Series (TMS) reduction should be applied down to the system level. Effective utilization of this document can help enable that transformational step.

## III. AVIONICS.

**A. <u>Core Avionics</u>.** Core avionics include those electronic systems that provide functionalities in support of the fundamentals of flight (aviate, navigate, communicate), as well as flight safety, platform survivability, and information management in support of individual and collaborative mission accomplishment. When they have application across multiple platforms, avionics can be considered 'common' or 'commodity' systems. In this master plan, core avionics are divided into the following functional capability areas:

- Information Management – planning, processing, display
- Information Exchange – voice, data, imagery, video, tactical networks, encryption
- Navigation – position, velocity, altitude, attitude and time (en-route and approach)
- Cooperative Surveillance and Combat Identification – battle-space management
- Flight Safety – collision/terrain avoidance, parameter recording, health monitoring
- Self Protection – threat sensors and defensive countermeasures

**B. <u>Unique Avionics</u>.** Unique avionics include those systems that enable a capability that is specific to a particular platform. In some cases there are no other platforms that perform that mission task. In other cases these are solutions whose design factors are so unique that they could not be practically integrated into other aircraft, such as with the E-2 radar. Although CAMP 2012 is scoped to focus on core systems, many of the strategies and practices described in this plan can also be applied to unique systems. Unique avionics can be grouped into the following functional capability areas:

- Sensors – radars, radio frequency, infrared, optical, 'listening' systems
- Ordnance Controllers – weapons arming and release
- Offensive weapons systems – lasers, jammers
- Specialized data links – Intra-community Intel/Surveillance/Reconnaissance transceivers and wave forms, unmanned aircraft flight control signals
- Classified Systems

**C. <u>Avionics Relevance</u>.** Core avionics manage information, provide situational awareness and enable decision-making to execute all missions, whether they are training, transport or combat related. The following evolving avionics enabled capabilities will transform air warfare to meet Naval Aviation Vision 2030 goals.

- Inter-platform Digital Interoperability for Networked Warfare
- Secure Combat Identification (CID)
- Blue Force Situational Awareness (BFSA)
- Secure, GPS-based en-route, precision and non-precision approach navigation
- Unrestricted global access through foreign and domestic civil airspaces
- Multi-level, secure communications and information exchange
- Military Flight Operations Quality Assurance (MFOQA) for safety/proficiency
- Condition-Based Maintenance (CBM)

## IV. RECOMMENDED PRACTICES.

With limited resources available to balance current and future readiness, Naval Aviation cannot afford to pay for independent development or separate and discrete modification of core avionics over every platform's life cycle. The Fleet cannot afford duplicative overhead costs of multiple unique systems that address a similar functionality. The acquisition workforce must work to capture overhead efficiencies that reduce their costs of doing business. The Secretary of Defense (SECDEF) and Chairman of the Joint Chiefs of Staff (CJCS) recently instituted a comprehensive revision of the requirements generation process and acquisition management instructions. In order to provide the greatest aviation system capabilities and warfighting benefits for the dollars available, this master plan presents recommended practices for each realm of the NAE triad.

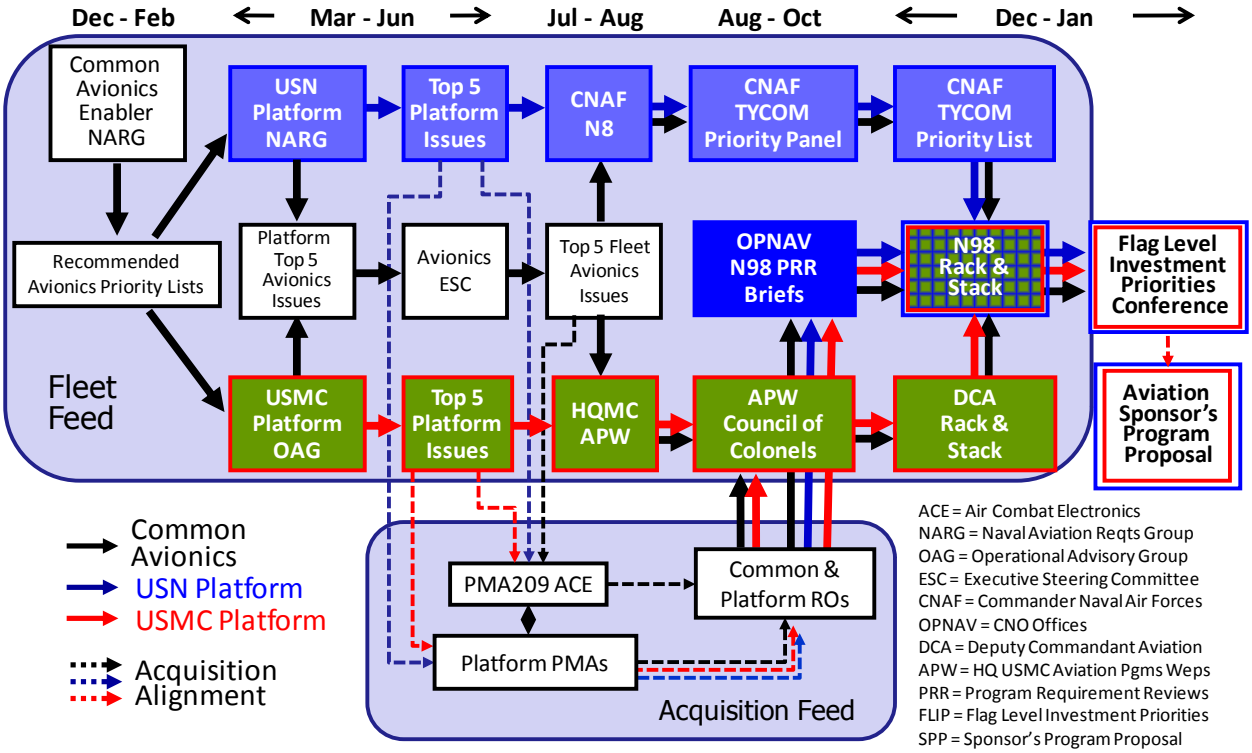
**A. Requirements.** Requirements are capability needs identified (generated) by warfighters and formally documented using processes prescribed in CJCS Instruction 3170.01F, Joint Capability Integration and Development System (JCIDS). Solutions to satisfy requirements are developed, fielded and sustained by acquisition program managers. Funds to cover solutions development, fielding and sustainment are allocated by Navy OPNAV and Marine Corps Deputy Commandant, Aviation (DC/A), resource sponsors. When Fleet operators first identify specific mission capability gaps, they are not constrained by resource limitations. Fiscal realities are applied later during issue prioritization in the programming and budgeting phases of budget building. Leaders are encouraged to apply the following recommended requirements identification and documentation practices to promote efficient fielding and sustainment of capabilities enabled by core avionics.

**1. Use the USN Naval Aviation Requirements Group (NARG) and USMC Operational Advisory Group (OAG) processes to identify and prioritize core avionics requirements according to collective need and benefits.** In response to the Fleet Forces Command (FFC) Requirements office call for more standardization in Fleet requirements identification, the aviation Type Commander (TYCOM), Naval Air Forces (CNAF), promulgated CNAF Instruction 3025.1. It establishes methodologies and guidance for aviation requirements identification and prioritization. This document was updated in December 2011. It outlines roles, responsibilities and processes for conducting NARG events, which replaced the former Navy OAGs. The Marine Corps continues to use the OAG process, but directly interfaces with the NARG process. The instruction establishes both Platform NARGs and Enabler NARGs.

Common Avionics, Cooperative Surveillance and Airborne Electronic Warfare Enabler NARGs are held prior to Platform NARG and OAG meetings. A Marine Corps Avionics Officer serves as the CNAF N8 Common Avionics Requirements Officer, and chairs the Common Avionics Enabler NARG and Executive Steering Committee (ESC) events. Platform community representatives are invited to the Enabler NARGs. They are briefed on avionics-enabled capability areas to help understand solution maturity, operational relevance and timing of applicable deadlines. They also collaboratively develop tailored recommended priority lists of commodity system enabled requirements.

Platform NARG and OAG attendees review the Enabler NARG recommended priority lists at their platform events and formally report concurrence or changes to the recommendations. Each Enabler NARG ESC then collates the Platform NARG and OAG responses and builds a collective (Enterprise-perspective) priority list that is presented to the TYCOM Priority Panel (TPP). The TPP uses those lists to generate the TYCOM Priority List (TPL), which is used to influence the Aviation Sponsor's Program Proposal (SPP) budget build. Marine Corps Platform OAG results are also provided to the Headquarters Marine Corps (HQMC) Aviation Weapons Systems Requirements Branch (APW) Council of Colonels, which prioritizes issues for budget consideration.

Platform community leaders are strongly encouraged to send experienced operators who are familiar with their mission sets to the Enabler NARG events. When possible, it is best if these same personnel are available to carry what they learn at the Enabler NARG event to the Platform NARG or OAG event. This allows avionics-enabled capability growth to be championed by a community member, rather than the commodity system managers. Except for safety systems, which are mandated by OPNAV and DoD instructions, there are no formal requirements to field avionics systems per se. The requirement comes in the form of the operational mission contribution that a platform performs with the capability enabled by the avionics. Therefore, all requirements for avionics must be sponsored by Fleet (platform) users. The Enabler NARG process provides a vehicle to align that sponsorship.




**Core Avionics Issue Capture Process.**

**2. Where possible, leverage existing Service and Joint capability documents to accelerate formal requirement establishment.** The JCIDS instruction lays out the procedures for analyzing identified capability deficiencies and formally documenting them in Initial Capability Documents (ICDs), Capability Development Documents (CDDs), and Capability Production Documents (CPDs). In the Marine Corps, capability needs can also be documented by Joint Urgent Operational Needs (JUONs) and Universal Needs Statements (UNSs) or Urgent UNS (UUNS). Joint Capability Documents (JCDs) are required to be established in order to initiate acquisition programs and apply resources to field and sustain solutions. There are few capabilities that have not already been outlined in JCDs in at least one of the military Services. Platform and commodity managers pursuing new programs or spiral upgrades are encouraged to leverage existing JCDs to accelerate program initiation. OPNAV N98 has personnel assigned to assist with review of existing JCDs, as well as development and staffing of new ones.

**3. Use commodity evolution roadmaps to align the timing of pursuit and integration of avionics-based capabilities across platforms to enable collective resourcing and broader benefits.** Requirements are generated when threats change, tactics change or new mission creates a capability gap. Avionics solutions can address many of those requirements. This document speaks to ‘core’ solutions that apply to most platforms. The roadmaps presented in the appendices of this document are divided into the core capability areas shown in Section III above. The timelines for activities in the capability sub-elements portray when enhancements are being developed and are expected to be mature, based upon technology growth and programmatic preparation time. Platform requirements officers and program managers are recommended to use these roadmaps to create their capability roadmaps and flight plans so that they may align with planned avionics capability enhancements as well as other platform initiatives to deliver broader collective benefits and improved interoperability across the enterprise.

**4. Define requirements in terms of warfighting capabilities necessary to accomplish a platform mission in support of Combatant Commander strategic objectives.** DoD leadership has outlined future warfighting capability objectives in Joint Vision 2020. The Navy Aviation Plan 2030 (NAvPlan) and Marine Corps Aviation Plan (Marine AvPlan) list more detailed objectives for Naval Aviation warfighting capabilities, including more detailed definition of future force structures. The ultimate customers for capabilities enabled by core avionics are not necessarily the platform communities, but the COCOMs who apply their mission sets in Joint operations. Clear explanation of the specific tactical application is essential in the budgeting prioritization process. Proposed issue costs are built upon programmatic aspects, but resource allocation prioritization decisions are primarily based upon criticality of operational capability gaps and warfighting benefits. For example: funds are not required to ‘integrate SATCOM;’ they are required to ‘enable platform X to conduct over the horizon tactical information situational awareness exchanges in order to perform long range expeditionary operations in support of Joint Command and Control objectives.’

**B. Resourcing.** During the Programming phase of the Planning Programming Budgeting and Execution (PPBE) process, the OPNAV N98 and DC/A aviation resourcing offices host Program Requirements Reviews (PRRs) and Council of Colonels review for all platform and commodity program offices. Resource allocation decisions are based upon issue criticality, urgency of need (timing), depth of contributions to JCAs and affordability. Leaders are encouraged to apply the following recommended practices to support effective and affordable resourcing of core avionics enabled capabilities.

**1. Use road-mapping processes to conduct cross-platform and commodity office exchanges during budget issue preparation.** The commodity system roadmaps presented in the CAMP differ in format from platform roadmaps or flight plans. They characterize evolving states of maturity of core capability enablers; whereas flight plans represent time-phased strategies to budget for and incorporate mission capability enhancements. Each entry on the CAMP roadmaps is backed up with a descriptive paragraph in the appendix that provides enough detail for users to determine whether or not that element has operational relevance to their mission set. Since these roadmaps address core systems, most elements will have application to all aircraft. This enables multiple platforms to collaborate and collectively present packaged resource requests that deliver broad benefits. The collective approach is usually more cost effective than several stove-piped initiatives because redundant infrastructure elements are eliminated. Even more importantly, the issue gets stronger traction with collective advocacy versus when it is competed between independent presenters.

The Naval Aviation Center for Rotorcraft Advancement (NACRA) has been chartered by DC/A and Program Executive Office, Air ASW, Assault and Special Missions Programs [PEO(A)], to leverage Joint Service initiatives to streamline integration of capability enhancements. One of NACRA's functions is to facilitate alignment of standardized platform roadmap formats with commodity roadmaps to enable improved cross-talk and consistency in requirements issue characterization. They are also working to standardize vertical lift platform program office "Battle Rhythms" for building budget submits.

**2. Ensure issues with application across multiple platforms are coordinated with commodity program offices, OPNAV N98 and HQMC APW73.** The commodity program offices (PMA209 Air Combat Electronics, PMA281 Mission Planning and PMA272 Advanced Tactical Aircraft Protection) should be directly involved in platform preparation of issues that are enabled by their core systems. OPNAV N98 and DC/A POM serial guidance has encouraged platform managers to pursue such exchanges when preparing issue sheet budget requests for the PRRs and Council of Colonels. OPNAV N98 and APW-73 Requirements and Action Officers are directed to present rollups of commodity capability issues across the platforms. This enables the resource sponsors to understand the overall costs, efficiencies and benefits of commodity enabled capabilities as they apply across the NAE. Coordination of core capability issues with OPNAV N98 and APW73 allows individual platforms to leverage momentum of collective enterprise-level benefits and promotes interoperability. Resource sponsors understand that rolled-up issue representations show a higher cost, but the total cost is less than the sum of several independent solutions.

**3. Leverage alternative avionics resourcing opportunities.** A program office may not have a program element or funding stream to address emerging avionics component issues, particularly when they come in the post-production sustainment phase. With the pace of technology rolls and obsolescence with digital systems, issues pop up that cannot be addressed in a timely fashion using the PPBE process. Component issues usually do not successfully compete for internal resources against major platform-specific mission systems, weapons upgrades or airframe integrity sustainment issues. Components that are centrally managed are more likely to have active resources for modernization/improvements as they evolve because they can leverage research and development available in new platform funding lines. Independent platform appeals for resources to modernize in order to increase reliability, reduce sustainment costs or avoid obsolescence supportability train wrecks may be more challenged to achieve Returns on Investments (ROI) because the fixes will affect a smaller inventory or repair demand. Common systems have broader application of modernization or upgrade benefits. The following programs and processes offer alternative resourcing options.

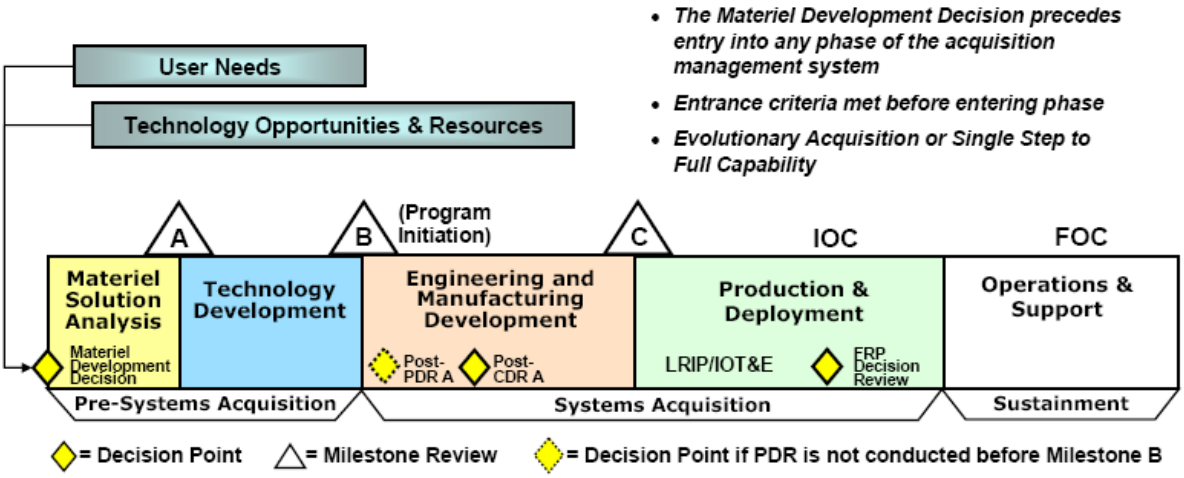
**(a). Navy Supply Systems Command (NAVSUP) Logistics Engineering Change Proposal (LECP).** The NAVSUP (formerly known as NAVICP) Weapons Systems Support (WSS) department provides support to common systems programs at NAVAIR. The NAVSUP Buy Our Spares Smart (BOSS III) program (NAVSUPINST 4105.1A) continually reviews candidate proposals to fix problematic repairable components. The program focuses on supply management cost reductions and seeks to achieve an aggregate ROI across all initiatives of two to one over seven years (five years after the new unit is fielded). If a submission is approved by the review board, NAVSUP Navy Working Capital Funds (NWCF) can be applied for both Non-Recurring Engineering (NRE) and procurement funding. (Visit https://www.navsup.navy.mil).

**(b). DoD Value Engineering Change Proposal (VECP).** Federal Acquisition Regulation (FAR) law and the DoD FAR Supplement prescribe Value Engineering clauses to be included in prime vendor contracts. FAR Section 52.248-1 outlines two alternatives in which the vendor or Government sources can fund product improvements to achieve savings or cost avoidances. The DoD 4245.8-H Value Engineering Handbook delineates proposal procedures and presents sharing ratios describing how savings are distributed between the vendor and the affected user program. Additional information is available at http://rtoc.ida.org/ve/ve.html.

**(c). Mid-year reprogramming.** PEO's analyze their program offices' funding execution throughout the year. Dynamics of acquisition management create opportunities to redirect resources to address emergent critical issues. Well-defined avionics solutions that address currently critical problems may compete for these resources if they are in a position for rapid funds obligation. Solicitations for candidate initiatives are usually promulgated through Engineering Class Desk channels.

**(d). Supplemental Funding.** Overseas Contingency Operations (OCO) operations erode equipment inventories and highlight poor component performance. The NAVAIR War Council reviews applications and allocates supplemental funds to address emergent Fleet war-fighting requirements and sustain a posture of combat readiness within the NAE. OCO funds are expected to end in fiscal year 2013 or 2014.

**C. Acquisition.** Acquisition management is performed by the "Provider" element of the NAE triad. NAVAIRSYSCOM develops, delivers and sustains system solutions for the Fleet users. DoD Transformation has driven significant revision of the DoD and Secretary of the Navy (SECNAV) 5000 series acquisition instructions. Policies and direction now more directly align with JCIDS processes to focus on support for the COCOMs. DoDI 5000.02 also presents a framework for Evolutionary Acquisition, which is described as the preferred strategy for rapid acquisition of mature technology for the user. PMs have ultimate responsibility for cradle to grave management of their weapons systems. Recommended practices presented in CAMP 2012 are built upon existing acquisition policies that support defined NAE objectives.




**Defense Acquisition Management System, Dec 2008.**

The following acquisition guidance covers processes and practices that support CAMP 2012 and Naval Aviation leadership objectives.

SECNAVINST 5000.2E (para. 2.4.6.5. Standardization and Commonality) states: "Common systems can provide efficiencies that include inherently greater interoperability, lower total ownership costs, improved human performance, consistent and integrated roadmaps for system evolution, and planned dual-use functions. Acquisition strategies shall identify common systems integrated into the acquisition program."

SECNAVINST 5000.2E (para. 5.4.1 Weapon System Analysis of Alternatives) states: "The cognizant program executive officer (PEO), SYSCOM commander and direct reporting program manager (DRPM), or ASN(RD&A), and Chief of Naval Operations (CNO) and Commandant of the Marine Corps (CMC), but not the PM, shall have overall responsibility for the AoA which shall be conducted per the guidance provided in reference (a). The CNO and CMC, or designee, as supported by the analysis director, shall propose the AoA study guidance for pre-ACAT IC, IAC, II, III, IV programs and an AoA study plan for all pre-ACAT programs in coordination with an AoA integrated product team (IPT), under the overall guidance of the Acquisition Coordination Team (ACT) where established. Common systems shall be included as one of the alternatives when one may provide the needed capability."

SECNAVISNT 5000.2E (para. 6.1.9.2. Standardization and Commonality) states: "PMs shall seek and employ DON Enterprise-wide commonality to reduce the proliferation of non-standard parts, material and equipment within and across system designs. The process shall include the periodic evaluation of different items having similar capabilities, characteristics, and functions used in existing type, model, series and class designs to reduce the number of distinct items."

ASN RDA Memorandum (23Dec04. Horizontal Systems Engineering) states: "Cross-platform commonality is difficult to reconcile with requirements and schedules in our normal vertical management of acquisition programs. It becomes further complicated when we delegate decisions on modularity and families of systems to prime contractors, who will understandably optimize for their particular business models rather than ours." This memorandum established Executive Committees to "make recommendations and action assignments to develop architectures, roadmaps and implementation plans to increase commonality" and to "seek opportunities for Enterprise-wide commonality in hardware and software modules."

Leaders are encouraged to apply the following recommended practices to promote efficient acquisition and fielding of core avionics-enabled capabilities.

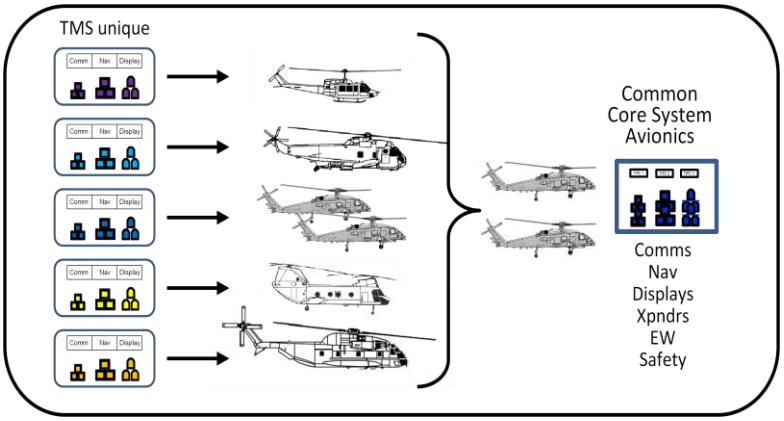
**1. Prominently factor commonality, standardization, interoperability, supportability and affordability during development of new capability solutions or enhancements.** Component commonality can enable the following benefits:

- Avoidance of duplicative research and development investments
- Avoidance of duplicative sustainment management and upgrade efforts
- Reduced acquisition staffing
- Economy of scale in procurement
- Increased competition by Industry interest (larger contracts)
- Fewer logistics tails and reduced logistics overhead
- Reduced spares requirements and smaller inventory footprints
- Increased applicability of upgrades and enhancements
- Increased interoperability

Program management and operational employment successes achieved with the ARC-210 radio and other common system solutions can be emulated across other core products. In early phases of system design or modification efforts, PMs should assess potential benefits and risks of developing a new system against tailored application of a known solution. Unique solutions may appear more attractive in the near term because they usually have fewer dependencies and allow more direct control of resources. However, unique solutions can also present significant modernization and sustainment challenges over the remaining life cycle when they have to be independently funded. There are compelling cases when a unique solution is appropriate. Justifications for decisions to proceed with unique solutions should be formally recorded for Milestone Decision Authority (MDA) approval in Acquisition Strategy (AS) and Acquisition Program Baseline (APB) documents.

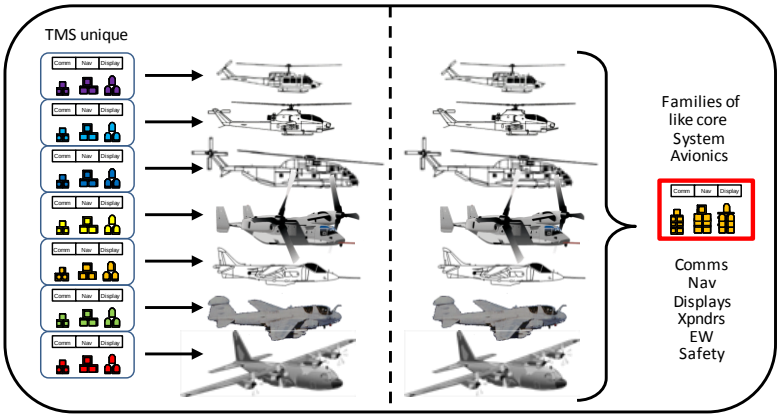
**2. Leverage established solution development momentum, maturity or lessons learned. Coordinate deliberate convergence toward common products or families of systems.** The DoD 5000 series directs that Doctrine, Organization, Training, Materiel, Leadership, Personnel, and Facilities (DOTMLPF) reviews will be conducted to determine if a capability gap can be addressed without a materiel solution. When a materiel solution is called for, it then directs that Commercial Off the Shelf (COTS) solutions be explored first. Similarly, existing military solutions should be reviewed for applicability before pursuing a new solution.

Benefits achieved with deliberate convergence (necking down) of Navy helicopter TMS came not only from eliminating several unique airframe sustainment infrastructures, but also from reductions of many unique component sustainment infrastructures. The cost avoidances achieved freed resources to enable more system-enabled capability integration. Additionally, even though the two remaining variants have different mission sets, they were purposefully designed to achieve efficiencies from commonality in their core avionics systems.




**Navy Helicopter TMS neck-down efficiencies.**

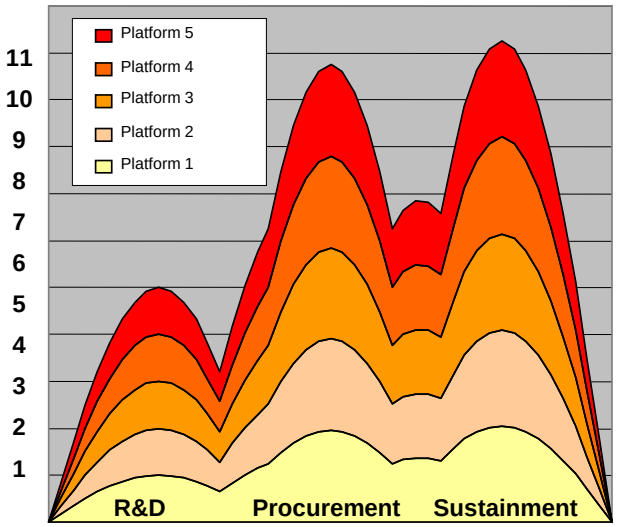
Similar efficiencies can be captured by applying these deliberate convergence principles at the system component level across other existing platforms.



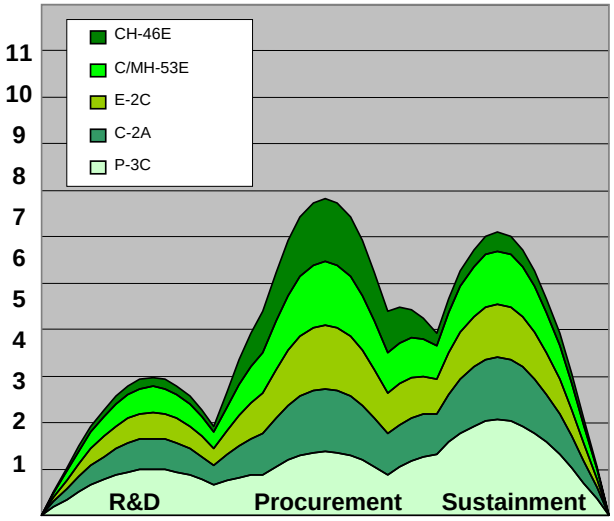

**Potential USMC Assault Support deliberate convergence efficiencies.**

The following graphic presents an example of resourcing efficiencies that have been achieved through centrally managed integration of Air Traffic Control interface systems.

Independent versus leveraged costs for integration of Air Traffic Control functionality.




**Life-cycle costs ($M) for 5 platforms independently integrating Mode S**




**Actual life-cycle costs ($M) for 5 platforms leveraging centralized integration of Mode S**

Established program modernization upgrades and capability enhancements should also leverage prior efforts or established solutions whenever practicable. The roadmaps presented in this document identify what evolutionary capability steps are already being developed in avionics enabling systems and when they are expected to be fielded. If the timing of those advancements can meet platform mission needs and modification schedules, existing momentum and funding can accelerate integration. PMA209 also serves as the Naval Aviation representative to the Joint Services Requirements Committee (JSRC), which is chartered to leverage accomplishments and promote commonality across the Services.

**3. During program baseline assessments, use the NAVAIR Commonality Opportunity Review Process (CORP) process to analyze alternative solution logistics footprints, modernization costs and sustainment life cycle impacts across the full life cycle, and to the Enterprise rather than to the individual platform.** NAVAIRINST 5000.25 (CORP) was established to maximize cost-wise resource allocation decisions across the NAE, as well as to promote interoperability and reduce deployment logistics footprints. CORP projects are executed by NAVAIR Program Office, Program Executive Officer (PEO) staff and Competency personnel using standardized procedures, templates and checklists that enable business case analyses and analysis of alternatives based upon factual data. The process enables quantitative assessment of common versus unique system costs and benefits over the life cycle and across the NAE. It is intended to be applied prior to requests for fiscal resources or program initiation. The CORP Handbook identifies process details, timelines, roles and responsibilities and deliverables.

**4. Employ Open Systems Architecture (OSA) in hardware and software designs. Adhere to collective interoperability standards and protocols in order to control future modification costs. Design future platform and evolve current platform processing architectures toward an Open Application Interface configuration (FACE Future Airborne Capabilities Environment) that allows system software to be integrated without requiring full mission profile regression testing.**

SECNAVINST 5000.2E. (para. 2.4.6.1. Strategy and para. 6.1.4. Open Architecture) states: "Naval open architecture precepts shall be applied across the Naval Enterprise as an integrated technical approach and used for all systems, including support systems, when developing an acquisition strategy."

Recent executive committee and task force analyses have identified platform architectural and software diversity as the most significant cost driver of Naval Aviation capability evolution. Software code modifications for single function integration, such as Mode S or Mode 5, are estimated to run into the tens of millions of dollars per platform, even if the host component was previously integrated with hooks to enable growth. Although Joint Technical Architecture (JTA) mandates are being complied with, some systems still have proprietary code or design issues that prevent leveraging upgrades developed for like systems. Truly open architecture should allow open interface with new technology, COTS products and Non-Developmental Item (NDI) solutions irrespective of the specific provider source. Commercial personal computing and telecommunications products have achieved this construct with operating system software and peripheral devices. NAVAIR program management can help drive this necessary shift in the aviation and avionics industry.

Interface with standardized protocols does not fully cover the "Open" part of the Open Architecture equation. Most of our platforms do not have computer architectures that are configured to allow rapid and reduced cost integration of new capabilities because all new software gets directly hosted by the main Operational Flight Profile (OFP) or operating system software. Constant changes to the core software to enable interface with new applications quickly saturates processing capacity. If the architecture is not structured to practically upgrade to more processing or memory storage capacity, the platform can reach a condition of functional obsolescence. The application interface point design can mitigate the capacity issue by separating application integration from the OFP core software. Many future capabilities will be integrated into platforms via software. The combined costs of required near term communications upgrades, datalink integrations, GPS waveforms and encryption corrections make the case for deliberate convergence to a common application interface management structure.

Both OPNAV and DC/A strongly endorse development and integration of FACE architectures in Naval Aviation platforms. A FACE construct (bypassing full OFP regression testing) can be achieved without replacing the current mission computer by using a modular or partitioned processing design, or distributed processing managed in other components, such as recorders, moving maps or even digital flight instruments and displays. Once the FACE architecture is in place, multiple users will be able to take advantage of centrally developed applications, more like the open applications library model currently employed in smart phones and personal computers.

In 2010, PMA209 led the establishment of a FACE consortium made up of industry representatives and military aviation stakeholders. Their job included development of common standards and protocols for the computing environment. In January 2012, the first FACE standard was published. This protocol will enable simpler, faster and more affordable integration of components and software enabled capabilities. Common standards will benefit platform capabilities by allowing more competition across industry, which brings down price and expands innovation across a broader provider base. It will also enable government entities to more directly provide and control capability enhancements. FACE standards should be used for new avionics developments and analyzed for feasibility during system modifications or upgrades.

**5. Ensure that Performance-Based Acquisition and Logistics (PBA, PBL) contracts can effectively and affordably leverage common product upgrade opportunities, whether they involve Government or other vendor Commercially Furnished Equipment. Work to eliminate unique interfaces and proprietary ownership.**

DoD Directive 5000.1 (E1.16) states: "To maximize competition, innovation, and interoperability, and to enable greater flexibility in capitalizing on commercial technologies to reduce costs, acquisition managers shall consider and use performance-based strategies for acquiring and sustaining products and services whenever feasible. For products, this includes all new procurements and major modifications and upgrades, as well as re-procurements of systems, subsystems, and spares that are procured beyond the initial production contract award."

SECNAVINST 5000.2E (para. 2.4.7. Support Strategy) states: "PBL is the preferred support strategy and method of providing weapon system logistics support."

In a performance-based acquisition or logistics construct, increased profit motivates the provider to improve performance and reduce cost. The vendor is empowered to implement engineering changes without waiting for Government offices to identify and provide (unplanned and un-programmed) resources. Sustainment strategies should utilize the best public and private sector management capabilities and incorporate effective government and industry partnering initiatives. Effective performance-based contracts require comprehensive planning using a full life cycle perspective. Unless properly structured, single point ownership of the weapon system may drive unique design work (or additional pass-through costs) when trying to upgrade core commodity systems, regardless of whether they are Commercially Furnished Equipment (CFE) or Government Furnished Equipment (GFE). Care should be taken to avoid a contractual situation where the government is charged a premium or is prohibited from capitalizing on common or commodity system upgrades. In any case, a Business Case Analysis (BCA) should be conducted to compare alternative product support strategies and determine the best value solution for the government. The DoD Product Support BCA Guidebook (issued April 2011) provides guidance for performing BCAs. The guidebook and additional supporting information can be found at http://www.acq.osd.mil/log/mr/library.html.

**6. Consider using PMA209's government based Avionics Capability Integration Support Team (ACIST) as an alternative to prime vendor for Lead Systems Integrator (LSI) activities involving avionics.** PMA209's ACIST program serves as the Lead Systems Integrator for Communications Navigation Surveillance / Air Traffic Management (CNS/ATM) functionalities. Their efforts have provided enhanced glass cockpit upgrades to fixed wing and rotary wing, Navy, Marine Corps and US Coast Guard aircraft. They heavily leverage prior efforts to significantly reduce costs of subsequent integrations. Their software re-use exceeds 90 percent, which promotes more commonality and interoperability between the platforms. They have also designed the civil functionality upgrades to enable provision of additional military operational capability benefits. While addressing current civil interoperability (global access) requirements, they have put the foundation/hooks in place for future requirements. Their products have overcome and eliminated proprietary issues, enabling faster and cheaper future modifications. Furthermore, their cockpit schemes are also being emulated as designs for next generation platform replacements.

**7. Establish pro-active sustainment teams to forecast and mitigate obsolescence and Diminishing Manufacturing Sources and Material Shortages (DMSMS) operational impacts and cost burdens.** The post-production sustainment phase of the weapon system life cycle can present some of the greatest challenges to the acquisition manager. Modification resources (APN-5) are more limited and their applications more restricted. Management reserves are discouraged, but performance, obsolescence and sustainability issues are often difficult to predict with enough detail to justify dedicated resource needs to comptrollers. Platform lives have been extended ten to fifteen years while living within the five-year 'sundown' stage, which prohibits integration of increasingly critical modification efforts. [Per ASN RDA Memorandum (09Aug06), the five year rule does not apply to modifications costing less than $100,000, or costing less than $1,000,000 for items that can be re-used again on another platform, or to safety systems. The rule can also be waived by ASN RDA.] Legacy platforms have established obsolescence funding lines or flexible sustainment accounts by demonstrating comprehensive knowledge of specific component issues.

SECNAV Memorandum (20Aug04) addresses DMSMS policies. Every NAVAIR program office has been directed to implement an Obsolescence Management Plan. Program managers are encouraged to establish sustainment teams that pro-actively identify avionics system performance degradation and address impending supply and support issues before they threaten to impact Fleet readiness. Supply and maintenance data systems provide detailed component and parts availability and performance data. Advance identification of parts that will no longer be available due to technical obsolescence and DMSMS issues allows teams to react and make timely component sustainment decisions (retain, redesign, replace, re-use, retire). Pro-active tracking can eliminate premium charges for retooling or limited production procurements. Often distributors will have stockpiles of discontinued items that will support component repair through the remaining life cycle. NSWC Keyport has extensive experience with analyzing component obsolescence at the piece-part level. They can determine what percentage of parts will reach an obsolescence status in the near, mid and longer term, and perform comprehensive distributorship searches. Post-production common avionics are managed by PMA209's Fleet Avionics Systems Support Team (FASST) staff.

DoD 4140.1-R, Section C 3.6, Supply Chain Material Management (23May03) requires each DoD component to develop a process to proactively manage DMSMS throughout the system life-cycle. SECNAVINST 5000.2E provides DoN guidance for management of DMSMS and establishes NAVAIRSYSCOM DMSMS policy, procedures and responsibilities. It states, "PMs shall manage obsolescence at the piece part level for all active microelectronics, unless otherwise supported by a business case analysis. Performance Based Logistics (PBL) agreements shall address mitigation of DMSMS risk to their program and the government." The NAVAIR DMSMS instruction (NAVAIRINST 4790.35) directs every program office to implement a proactive DMSMS program plan. The purpose of the program is to mitigate the impact on total ownership cost and schedule, enhance the interchangeability, reliability and availability of parts; and promote synergy across NAVAIR programs through collaborative sharing and teaming on DMSMS solutions, information, processes, tools and practices. The DMSMS program should incorporate or consist of a DMSMS Management Plan, a DMSMS Management Team, DMSMS data, and participation in the NAVIAR DMSMS Working Group. Program managers are encouraged to establish DMSMS teams that pro-actively identify avionics system performance degradation and address impending supply and support issues before they threaten to impact Fleet readiness.

Supply and maintenance data systems along with DMSMS predictive tools provide detailed component and parts availability and performance data. Advance identification of parts that will no longer be available due to technical obsolescence and DMSMS issues allows teams to react and make timely component sustainment decisions (retain, redesign, replace, re-use, retire) and chose the most cost-effective solutions. Pro-active tracking can eliminate premium charges for retooling or limited production procurements. Often distributors will have stockpiles of discontinued items that will support component repair through the remaining life cycle. Within PMA209, the FASST staff personnel have extensive experience with analyzing component obsolescence at the piece-part level. FASST can train teams within other IPTs how to establish a proactive DMSMS approach and determine what percentage of parts will reach an obsolescence status in the near, mid and longer term, and perform comprehensive distributorship searches. AIR-6.7.1.6 provides policy and process guidance and can provide tailored guidance and training to help establish proactive DMSMS plans and processes.

**D. <u>Best Practices Application</u>.** The recommended practices presented in CAMP 2012 are not intended to override guidance or policy governing the three NAE arenas. They prescribe a strategic blending of existing guidance to achieve Enterprise objectives. The NAE itself was designed to facilitate improved communication and success across the disciplines in support of the aviation warfighter. CAMP 2012 strives to promote awareness across those disciplines so that core avionics system solutions can more effectively support the warfighter.

## V. ROADMAPS.

The CAMP 2012 appendices include roadmaps showing time-phased core avionics-enabled capability evolution over the next ten years. They are intended to promote awareness of avionics technology and solution maturity. Some functional aspects overlap across multiple roadmaps. Each appendix includes a background section that explains what systems and functionalities are covered in that capability area, along with descriptions of current capability baselines and future desired capability states. Amplifying paragraphs are presented in sequence with each entry on the roadmap elements timeline. They address funded program of record capability enhancement activities, gaps that are not yet being funded (but are recommended to be pursued to reach the desired end state), and related advance research and engineering activities that are expected to transition to programs of record or enhance existing capabilities. The Introduction appendix further explains the methodology and convention of the roadmap entries.

The roadmaps are intended to be used as planning tools to frame discussions between acquisition managers, Fleet requirements officers and resourcing requirements and action officers. Amplifications provided in the appendices are top level and fairly generic. Platform managers are encouraged to understand the capability enhancements that are represented, determine if they are applicable to their warfighting mission set, and then use the time-phasing to build those pursuits into their Flight Plans.