Waiting For The MV-22 Making The CH-46E Last

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SUBJECT AREA Aviation

EXECUTIVE SUMMARY

Title: Waiting for the MV-22: Making the CH-46E Last

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Thesis: Although the Marine Corps has funded programs to enhance the capabilities of the CH-46E, it is not enough. The Marine Corps needs to undertake initiatives that will increase the longevity of the CH-46E in case the MV-22 program suffers another delay or setback.

Discussion: The MV-22 is the chosen replacement for the CH-46E. The Marine Corps has made the MV-22 its' number one acquisition priority. Despite the priority given to it by the Marine Corps, the MV-22 program still has several key milestones to meet before its Initial Operating Capability (IOC). The IOC is scheduled for 2001, the first deployment of an MV-22 squadron is scheduled for 2004 or 2005. This means that the CH-46E will continue to provide the bulk of the medium lift assault support for the Marine Corps well into the first decade of the twenty-first century.

Recommendation: The Marine Corps should take steps now to guard against the possibility that the service life of the CH-46 will get extended due to an unexpected delay in the MV-22 program. To do this, initiatives aimed at the reduction of utilization, and improvement of the material condition of the aircraft should be undertaken.

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The CH-46 helicopter was built by the Boeing Helicopter Division in 1962 to replace the H-34 as the Marine Corps' medium lift assault support aircraft. Boeing built 624 H-46 aircraft before closing down the production line in 1971. At the time production began, the planned service life of the H-46 was 10,000 flight hours, which equated to approximately 20 years. Today, the CH-46 is still the Marine Corps' primary medium lift assault support aircraft.[1] Despite its age, technological obsolescence, and degraded capabilities, the CH-46 will continue to fulfill the medium lift assault support role for the Marine Corps into the 21st century.

The aged CH-46 will be replaced by the MV-22 Osprey. Over the years a number of studies have been conducted by the Department of Defense on the MV-22. A majority of those studies determined the MV-22 is the most cost effective and capable aircraft to meet the medium lift assault support mission for the Marine Corps through the 21st century. Acknowledging the age and limited capabilities of the CH-46, along with the potential of the MY-22, the Marine Corps has stated that "maintaining the MV-22 procurement program on track remains the number one acquisition priority for the Marine Corps."[2] This priority is driven by two things. First, by the necessity to keep the Marine Corps Aviation Combat Element (ACE) credible and relevant in littoral expeditionary operations through the next century, and second, it is fundamental to the execution of the Marine Corps' "neckdown" strategy in aviation.

The "neckdown" strategy is based on the need to field capable forces in a time when the defense budget continues to decline. The draft of Marine Corps Bulletin 3125 entitled "The Marine Aviation Plan For Fiscal Years 1996-2005" summarizes the "neckdown" strategy as follows:

> ...in a declining budget, we continue to "neckdown" the number of type/model/series (TMS) aircraft. This is an effort to field a more credible fighting force of advanced technological systems possessing affordable capabilities, reliability and survivability. This will be accomplished through the prudent procurement of new weapons systems, by upgrading existing platforms with modern technology equipment, and replacing obsolete systems

As part of the "neckdown", the CH-46 and CH-53D communities will transition to the MV-22. The Marine Corps is well beyond the point of no return on the MV-22 program, the question is no longer if the V-22 is going to replace the CH-46, but when. The Marine Corps has a plan for when, and an emerging strategy for how. There are enough personnel and aircraft in the CH-46E community to support the planned transition timeline. The one thing that needs more attention is the aircraft itself The Marine Corps needs to focus more energy and non-traditional thinking toward initiatives dedicated to preserving the longevity of the CH-46E, just in case the MV-22 program suffers a setback or delay.

The Marine Corps is short of CH-46E aircraft; however, the planned timeline for transition to the MV-22 will not exacerbate that shortage. Currently the Marine Corps has 240 CH-46E aircraft.[3] The Marine Corps' requirement for CH-46 aircraft is 252.[4] This numerical requirement is the resultant sum of Primary Authorized Aircraft (PAA) plus Baseline Authorized Aircraft (BAA). PAA is the total number of aircraft required by the Marine Corps to carry out its assigned missions. BAA, or "pipeline aircraft", is nine percent of PAA.[5] "Pipeline aircraft" are spare aircraft within the fleet used to replace aircraft that have been destroyed, damaged, or are out of service for Standard Depot Level Maintenance (SDLM) or modifications. The shortage of 12 CH-46E aircraft translates to a deficit in "pipeline aircraft". The intent of "pipeline aircraft" is to keep squadrons at PMAA. With a deficit in "pipeline aircraft" the only way to keep a squadron at PMAA is to transfer aircraft from one squadron to another. Transferring aircraft is normally

done to keep squadrons that are deployed, or are preparing for deployment, at the requisite level of twelve aircraft.

The Marine Corps' goal is to replace all CH-46E and CH-53D squadrons with the MV-22. This goal equates to a force of 18 active and 4 reserve MV-22 squadrons with 12 aircraft each, and one Fleet Replacement Squadron (FRS) with 40 aircraft. The planned Initial Operating Capability (IOC) for the MV-22 is FY01. IOC for the MV-22 is defined as, when the twelfth aircraft is accepted at the Fleet Readiness Squadron (FRS).[6] On the basis of current projections, the acceptance of the twelfth MV-22 at the FRS will occur in March 2001.[7] The first tactical squadron to transition to the MV-22 will stand down and begin to transfer its aircraft in July 2001. The actual transition training for its pilots and personnel is scheduled to begin in October 2001 and be completed in March 2002. That squadron will receive its twelfth MV-22 in March 2003. The first operational deployment of the first MV-22 squadron, serving as part of a Marine Expeditionary Unit (MEU), is targeted for FY05.[8] The next squadron scheduled for transition will begin that process in March 2002.[9]

The Department of the Navy has imposed a $1 billion dollar annual ceiling for procurement of the MV-22. This draws out the transition of active CH-46E squadrons until 2016. This lengthy transition should not create critical shortages in the numbers of CH-46E aircraft available. The current attrition rate for the CH-46E is 1.3 aircraft per year.[10] At this rate the CH-46E community will lose approximately eight more aircraft prior to the transition of the first CH-46E squadron. Although this equates to 75 percent of a squadron, the impact will be in the numbers of "pipeline aircraft" available. As squadrons begin to stand down the Marine Corps' PAA for CH-46E's will decrease. The net result is a decrease in the overall requirement for CH-46E's. If the V-22

program stays close to its projected schedule CH-46 aircraft will start to become available as "pipeline aircraft" when HIvIT-204 stands down as the CH-46E FRS and begins transition in FY00.[11] The only way that aircraft inventory could be become a factor for the CH-46E community is if there are any significant delays in the V-22 program or there is a significant increase in the CH-46E attrition rate.

One of the primary concerns of any unit is manning levels. Are there enough personnel in the unit to successfully carry out its mission? This concern is of considerable importance to the CH-46E community, which will be required to continue fulfilling its primary role of assault support while concurrently engaged in the transition to the MV-22. The Marine Corps' planned transition strategy is designed to minimize the impact to fleet operations (i.e., MEU(SOC), SPMAGTF, Forward Presence), and reduce the turmoil inherent in transitioning an entire community to a new aircraft. "This strategy will entail training squadrons as entire units, with the exception of Marine Executive Helicopter Squadron One (HMX-l), Marine Aviatin Weapons and Tactics Squadron One (MAWTS-1), and reserve personnel, transferring/receiving aircraft within VHMT-204, and returning the squadron to their respective operational sites".[12]

The current Table of Organization (T/O) for a CH-46E squadron and the proposed T/O for an MV-22 squadron are almost a mirror image. The current T/O of a CH-46E squadron lists 39 enlisted Marine Occupational Specialty's (MOS's) requiring 156 enlisted marines. Thirty-six of those 156 enlisted marines, representing 15 of the 39 MOS's, are in the Marine Aviation Logistics Squadron (MALS) and are not organic to the CH-46E squadron. The proposed MV-22 T/O requires 163 enlisted marines representing the same 39 MOS's found in the CH-46E T/O.[13] The increase in personnel required in the MV-22 squadron T/O is the result of an increase in the

number of marines required by the MALS, not the squadron itself From a strictly T/O oriented point of view, the transition to the MV-22 should be transparent to the CH-46E community.

The initial training for squadrons transitioning to the MV-22 will be done at VHMT-204 and the Fleet Replacement Enlisted Support Training unit (FREST). The initial training to support VHMT-204 and the FREST is scheduled to begin in 1998. The logical question then becomes -- given its current state of manning, can the CH-46E community support an added commitment? The short answer is “yes”.

The draft copy of the Joint Training Plan for the MV-22 outlines a requirement for fourteen enlisted instructors to fill billets at the FREST. According to the Aircrew Programs Section at Headquarters Marine Corps (HQMC Code ASM), MV-22 training for enlisted marines has been ongoing in varying degrees for the past ten years. Factory training has been given to a number of marines currently filling MV-22 billets in the Operational Test and Evaluation sections at Patuxent River and HMX-1. This does not imply, nor does the Marine Corps believe, that all these individuals will be available to fill instructor billets at VHMT-204. The exact number of individuals that have received MV-22 training is unknown, however, the Marine Corps is confident that there is a cadre of individuals with a background of MV-22 training large enough to begin initial training at VHMT-204 in 1998.[14] The process of identifying and locating those marines will be conducted in earnest between the summers of 1996 and 1997, with the goal of reassigning some of them to VHMT-204 and the FREST in 1998.

Training at the FREST for marines who will man VHMT-204, specifically those who will fix and maintain the squadron's aircraft, is scheduled to begin in 1998. At this time the CH-46E community will still have 15 active squadrons, one FRS and the added commitment of providing

personnel for transition training. The majority of the transition training will focus on the enlisted personnel in a CH-46E squadron who have a maintenance related MOS. For this reason, the following discussion of manning levels, and the ability of the CH-46 community to support MV-22 transition, will focus on enlisted maintenance MOS's.

By T/O, the Marine Corps needs a total of 1,545 enlisted marines with maintenance MOS's to man its 15 active CH-46E squadrons. The Marine Corps, however, does not man its units to meet T/O. The Marine Corps mans its units to meet "staffing goal". Staffing goal is a fair share distribution of the total number of marines, by MOS, into T/O required billets. The Marine Corps uses 80 percent of T/O as its staffing goal for the CH-46E squadrons. In 1994 and 1995 the CH-46E community filled, on average, 1,274 of the 1,545 billets.[15] This figure represents an average on-board strength of 82 percent. Not only is this figure above staffing goal, it is one of the healthiest in Marine Corps aviation. The aviation community with the lowest average on-board strength for 1994 and 1995 was the "skid" community (AH-l and UH-l), with an average on-board strength of 71 percent.[16]

To further the examination of CH-46E community manning levels, a discussion of specific enlisted MOS's will be used. In a CH-46E squadron's maintenance department 80 of the 103 enlisted marines required by T/O possess one of the following MOS's: 6112 (aircraft mechanic); 6172 (CH-46E crewchief); 6152 (CH-46E airframes mechanic); and 6322 (CH-46 avionicsman). Currently, the manning levels for these MOS's are 109, 83, 105, and 98 percent respectively.[17] For the Marine Corps to consider an MOS "critically short" it must have a manning level below 85 percent.[18] Using this criterion, the only MOS in the CH-46E community that could be considered "critically short" is the

6172 field. To say the 6172 MOS is critically short is misleading. Broken down by paygrade, the manning levels within the 6172 MOS are as follows:

Paygrade	E-7	E-6	E-5	E-4	E-3 to E- 1
Manning%	97	104	104	102	31*

***** The shortage in the E-l to E-3 paygrades is not CH-46E specific. The UH-l and CH-53 communities have similar shortages in the same paygrades. The shortages are caused by various factors common to all communities. HQMC is currently examining ways in which to alleviate the shortfalls.

In two years the initial training of personnel to man VHMT-204 is scheduled to begin. Based on the current manning levels, the CH-46E community will be able to support the additional commitment of providing personnel for transition training without a detrimental effect on fleet operations.

The ability of any aircraft to operate safely and effectively is dependent on several factors. Among these factors are, utilization (how much it is flown), supply support, and material condition of the aircraft itself. All of these factors are affected by the age of the aircraft. The CH-46E is still a safe aircraft to fly, but its ability to operate effectively into the next century is questionable without some dedicated initiatives aimed at extending its longevity.

The current service life of the CH-46 is 12,500 flight hours. The original service life was set at 10,00 hours.[19] The determination of the service life was not a purely scientific endeavor, nor was it merely arbitrary.[20] When the aircraft was first built the Marine Corps stated how long (in years) it anticipated using the CH-46. Boeing, using input from the Marine Corps, decided that 10,000 hours was an appropriate service life based on its projected mission and utilization. The service life is again going to be raised; this time to 15,000 hours.[21] This decision is based on

studies and testing done by engineers at Boeing and at the Naval Aviation Depot Cherry Point. The airframe itself is capable of lasting until 15,000 hours, but that does not mean that it will.

According to Marine Corps projections, the CH-46E is scheduled to fly until 2010. Currently the Marine Corps has 156 CH-46's in the range of 6,000 to 7,999 flight hours, and 63 CH-46's in the 8,000 to 9,999 flight hour range.[22] In 2010 the Marine Corps is projected to have 175 CH-46's in the 12,000 to 13,999 flight hour range, and 24 CH-46's above 14,000 flight hours.[23] With the planned service life extension to 15,000 flight hours the Marine Corps will not have to worry about retiring aircraft before the MV-22 is fully operational.

Regardless of what the service life is for the CH-46E there are other considerations and ramifications associated with continuing to operate the CH-46E, one of which is cost. In 1986 the CH-46E fleet flew 69,946 flight hours. This equates to a utilization rate of 25.1 (flight hours per aircraft per month). In 1995 the CH-46's flew 64,309 hours, for a utilization rate of 23.3.24 Over a 10 year period this is not a significant decrease in utilization for an aircraft that is approaching 30 years of service. Utilization may have gone down, but expense in operation has increased. The Direct Maintenance Man-hour per Flight Hour (DMMH) has gone up. In 1993 the DMMH was 17.7, in 1994 the DMMH was 18.8, and in 1995 it was 19.4. The flight hours flown for those years were 68,307, 65,292, and 64,309, respectively. This does not infer that the DMMH will increase with each year, it only highlights one of the costs of operating an old aircraft.

The Cost per Flight Hour (CPFH) for the CH-46E has also increased. In 1986 the CPFH was $1,050 dollars, in 1995 it was $1,791. For the first quarter of FY96 the CPFH was $1,946

dollars.[25] CPFH is the sum of the hourly costs for, fuel, parts repaired at a depot level repair facility, and consumable items (i.e. nuts, bolts, washers). The hourly cost for fuel has decreased from $144 dollars in 1986 to $119 dollars in the first quarter of FY96. The increase in CPFH is the result of increases in the cost to maintain the CH-46E, namely, depot level repairable items and consumables.[26]

Directly contributing to the increases in CPFH and DMMH is the material condition of the CH-46. As the aircraft gets older and logs more flight hours, the day to day upkeep becomes harder, especially if the aircraft routinely operates in a saltwater environment. A brief look at the Standard Depot Level Maintenance (SDLM) program will bear this out. The objective of the SDLM program is summarized in the OPNAVINST 4790.2 as follows:

> Comprehensive depot level inspection of selected aircraft structures and materials, correction of critical defects, incorporation of technical directives and limited removal/overhaul of SRC (scheduled removal component) items to provide operating units with a sufficient number of safe, reliable, mission capable aircraft with which to perform their assigned missions.

The SDLM program calls for aircraft to be inducted into a depot level repair facility at the end of its service period. The service period for the CH-46E is 30 months. The service period can be extended if the aircraft passes an Aircraft Service Period Adjustment (ASPA) inspection. The ASPA inspection is performed by depot personnel who check the material condition of the aircraft. If the aircraft meets the inspection criteria the service period is extended for 12 months. At the end of that 12 month period another ASPA inspection is performed and another 12 month extension can be granted. There is no limit to the number of extensions that can be granted for a single aircraft.

In 1992 it cost $433,238 dollars (1992 dollars) per aircraft to perform SDLM on a CH-46E.[27] In 1995 it cost $565,000 dollars to perform SDLM.[28] SDLM is guided by SDLM Specifications (SDLM Specs), these SDLM Specs are comparable to a playbook. They tell the individual depot worker what to take apart, when to take it apart, where to look for discrepancies, what to fix, and how long it should take. The current SDLM Specs estimate that it should take 5,953 man-hours to complete SDLM on one CH-46. Currently, the average actual man-hours being expended per aircraft is between 7,300 and 8,000.[29] The increase in man-hours translates to increase in turnaround time, from 60 days to 80 days, for an aircraft inducted into the depot for SDLM.[30]

The increases in cost, turnaround time, and man-hours are the result of an overall decrease in the material condition of the aircraft. The aircraft are being inducted with more discrepancies and/or more discrepancies are being found during the SDLM process. It is important to note that not all discrepancies are repaired during the SDLM process. Only those discrepancies found in areas covered by the SDLM Specs, or discrepancies that are categorized as "critical" are repaired at the depot.[31]

The final factor to be discussed is the availability of parts. Supply issues have had, and will continue to have, a major impact on the CH-46E's ability to operate effectively. Several problems arise because the CH-46 has gone past its service life, they are; (1) many life limited components are reaching their expiration; (2) parts integral to the airframe that were not envisioned to fail are failing, and there are no replacements; (3) some of the electronic equipment in the aircraft is technologically obsolete; and (4) the industrial support capacity is lacking or non-existent. Many of the vendors and sub-contractors that supported the CH-46 have gone out

of business or modernized their companies to the point where they cannot, or will not, produce CH-46 parts. Tied to the loss of industrial support is the loss of workers skilled in manufacturing parts. For example, in 1995 a woman who had worked for a sub-contractor was brought out of retirement to make a specific part for the CH-46 fuel system. This part had to be hand sewn, this woman was the only one who could be located with the skill and experience to produce this part.[32] This is not an isolated incident. The CH-46 has been hampered by non-availability of parts for years. It is a fact of aviation, the more an aircraft flies, the more parts it will need. Unfortunately for the CH-46E community the parts base from which it must work is severely debilitated. In the words of an anonymous source in the H-46 program office, "Because of the supply situation, the CH-46 community can only be reactive, not proactive."

The Marine Corps has initiated and supported several programs over the life of the CH-46E to enhance its capabilities, readiness, and availability. The latest program to be fielded is the Dynamic Component Upgrade Program (DCUP). The bulk of this program involves the replacement of rotor head components, synchronization shafts, and vertical shafts. This program *should* eliminate some of the capability, and maintenance and supply problems that have plagued the H-46 community recently. Programs that improve the communications, navigation, and Night Vision Goggle (NVG) capabilities have been budgeted, and are on the way to the fleet. These programs are good, they improve the warfighting capabilities of the CH-46E, but they do not, altogether, address the larger issue of preserving the CH-46E and extending its longevity.

The downside to new programs being retrofitted onto an old aircraft are the emergence of new problems. A case in point is the SR&M program (Safety, Reliability, and Maintainability). SR&M was a program carried out in the late 1980's to replace some dynamic components,

improve the flight control system, and improve the communications system. Almost immediately new avionics related problems began to emerge with the new flight control system, problems that are now finally being resolved with the DCUP. Along with the avionics problems came supply problems. The avionics problems caused by putting new technology on an old aircraft caused an unexpected demand for avionics parts, which in turn affected readiness and availability. It is too early to tell whether the same type problems will arise with the DCU program.

In a time of a declining defense budget the CH-46E could be seen as a "black hole" for scarce defense dollars. The abbreviated Service Life Assessment Program (SLEP), and the absence of funding for a Service Life Extension Program (SLEP) are indicators that large amounts of money are not going to be invested in an aircraft that is bound for retirement. If money is not available to support the CH-46E program, a way to extend the service life is to reduce its use.

The CH-53D is now considered a medium lift asset. This redesignation was enacted to address the overall shortfall in medium lift capability for the Marine Corps. On paper this looks good, but in reality the utility of this "reclassification" is limited. By 1 October 1997 all CH-53D squadrons will be in Hawaii, far removed from the six CONUS based MEU's. To truly make use of the Marine Corps "newest" medium lift asset the Marine Corps should investigate ways in which the CH-53D squadrons can contribute to the CONUS based MEU deployments. This is one way to reduce the utilization of the CH-46.

Another way in which to reduce the use of the CH-46E is to standdown one or two squadrons, send the aircraft to the depot for overhaul and then use the aircraft as "pipeline" aircraft. Establishing a pool of overhauled aircraft will allow for "healthier" aircraft to

be filtered back to deploying units. Unfortunately, this option is considered "politically incorrect" at Headquarters Marine Corps (HQMC) and is not discussed.[33] To standdown a squadron indicates an ability to do the same mission with fewer assets. This could jeopardize force structure and the ability of the Marine Corps to procure MV-22's in the desired numbers.

The third option that should be investigated is to change the mix of aircraft supporting MIEU deployments. Based upon CINC requirements the Marine Corps must support on average 5.2 MEU's per year with CONUS based assets.[34] The standard MEU Aviation Combat Element (ACE) is a CH-46E squadron reinforced by, four CH-53E's, four AH-1W's, and three UH-1N's. A composite squadron with fewer CH-46's, more CH-53's, and the same number of AH and UH aircraft, enhances the MEU's capability and reduces the utilization of the CH-46E's. The reduction in utilization of the CH-46's decreases parts usage and reduces a portion of the community wide wear and tear on the aircraft. By adopting this option, however, the Marine Corps' need for 425 MV-22's could be called into question.

If the reduction in the utilization for the CH-46E fleet is not possible, one final option is to target the material condition of the aircraft. This can be done with the elimination of the ASPA program combined with an expansion of the SDLM Specs. Eliminating the ASPA program will ensure that CH-46's are brought to the depot for inspection and repair on a regular basis.[35] Expanding the existing SDLM Specs will increase the areas for inspection, and increase the likelihood of depot personnel identifying and repairing more defects. Eliminating the ASPA program and expanding the SDLM Specs can only enhance the material condition of the CH-46, and contribute to the overall longevity of the fleet. In FY's 91, 92, 93, 94, and 95 a total of 177 CH-46E's were inducted into the Naval Aviation Depot (NADEP) at Cherry Point, an average of

44 aircraft per year. The NADEP has the capability to induct and process 90 aircraft per year, using the current SDLM Specs.[36] To make CH-46's available to support an increased induction rate at the NADEP the Marine Corps could *temporarily* change the mix of aircraft for MEU deployments, use a CH-53D squadron for a WESTPAC MIEU deployment, use some of the reserve CH-46's as "pipeline" aircraft, or a combination of any or all of those options.

The Navy has recently released a Request For Proposal (RFP) for commercial support of their Vertical Replenishment (VERTREP) mission.[37] This "thinking outside the box", is much like the idea of putting Army helicopters on an aircraft carrier for operations in Haiti. The Marine Corps may need to "think outside the box" in the very near future in order to preserve the CH-46 and keep it mission ready and available. There is no replacement for the CH-46. The MV-22 is *the planned* replacement, and it appears to be well on its way. The problem is, there is no back-up plan. If the V-22. program suffers another delay or an unexpected setback the CH-46's life will be extended further. The CH-46E community can support the planned transition to the MV-22 with aircraft inventory and personnel. The Marine Corps, in turn, needs to support the CH-46E community by undertaking initiatives that will contribute to the immediate goal of preserving the "tired iron" of the CH-46 just in case the MV-22 program timeline "slides to the right".

[1] In 1993 the Marine Corps designated the CH-53D as a medium lift assault support aircraft.

[2] Commandant of the Marine Corps, "The Marine Aviation Plan for Fiscal Years 1996-2005," MCBUL 3125 (draft), 2.

[3] Naval Air Systems Command (PMA(F)-226), "H-46 Program Review", January 1996, 2.

[4] Major Robert Renken, Aircraft inventory Branch at Office of the Chief of Naval Operations, telephone interview by author, 12 February 96.

[5] Naval Air Systems Command, "Management of Naval Aircraft Inventory," NAVAIRINST 5442.8, 18 April 1995.

[6] Commandant of the Marine Corps, 8.

[7] Major David Ingram, MV-22 Requirements Officer at Headquarters Marine Corps, interview by author, 27 September 1995.

[8] Headquarters Marine Corps (APW), "MV-22 Plan of Action and Milestones (draft)," 23 august 1995.

[9] The original transition plan called for the transition to the MV-22 to occur first on the east coast and then on the west coast, the draft of MCBUL 3125 calls for "simultaneous" transition.

[10] Naval Air Systems Command (PMA(F)-226), 4.

[11]HMT-204 will become the FRS for the MV-22 in FY00, at that time the squadron designation will become VHMT—204. The "VH" indicates the squadron operates the MV-22.

[12] Headquarters Marine Corps (APW), "V-22 Task Force Charter (draft)," 20 February 1996, 5.

[13] The exact MOS designation may not be the same, but the area of expertise is the same (i.e. a CH-46E engine mechanic MOS is 6122, the MV-22 engine mechanic MOS is 6125).

[14] Major Fred Wenger, Head Aircrew Programs Section at Headquarters Marine Corps, interview by author, 27 September 1995.

[15] Headquarters Marine Corps, Enlisted Maintenance Manning (data base), December 1995.

[16] Ibid.

[17] Major Derek Donovan, Head Aviation Enlisted Assignment Branch at Headquarters Marine Corps, telephone interview by author, 28 February 1996.

[18] Ibid.

[19] Service life applies to the airframe only, not to the components such as engines, rotor blades or avionics equipment.

[20] John Winchester, H-46 Program Manager at PMA(F) -226 Naval Aviation Depot Cherry Point, interview by author, 25 October 1995.

[21] ibid.

[22] Naval Air Systems Command (PMA(F)-226), 8.

[23] ibid.

[24] Chief of Naval Operations (N889E), OP-20 report.

[25] ibid.

[26] Inflation, and an increased surcharge imposed by the Defense Base Operating Fund (DBOF) account for a portion of the increase in CPFH.

[27] Data derived from information provided by Julie Woods, Financial/Business Manger, H-46 Program Office at Naval Aviation Depot Cherry Point, telephone interview by author, 6 February 1996.

[28] LtCol Gene Conti, Production Officer at Naval Aviation Depot Cherry Point, interview by author, 25 October 1995.

[29] ibid.

[30] ibid.

[31] In OPNAVINST 4790.2 a critical defect is defined as "one that constitutes a hazard to the airworthiness of the aircraft and must be corrected prior to flight."

[32] William Jannings, H-46 Technical Representative at MCAS New River, telephone interview by author, 6 November 1995.

[33] A source, in the Aviation Branch at Headquarters Marine Corps, who wishes to remain anonymous, telephone interview by author, 28 December 1995.

[34]Major James Connolly, Plans Policies, and Operations Branch at Headquarters Marine Corps, telephone interview by author, 11 January 1996.

[35] Personal experience as the Aviation Maintenance Officer of a CH-46 squadron shows that the PASS/FAIL of an aircraft undergoing ASPA is negotiable.

[36] LtCol Gene Conti.

[37] David S. Harvey, "Navy Issues RFP for Commercial VertRep," *Rotor and Wing,* February 1996, 12.

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