

## The Marine Light Attack Helicopter Paradigm, Upgrade, Replace or Invest in the Future

CSC 1996

SUBJECT AREA - Aviation

### **THE MARINE LIGHT ATTACK HELICOPTER PARADIGM: UPGRADE REPLACE OR INVEST?**

**“WE ARE ALMOST OUT OF MONEY...THEREFORE WE  
MUST THINK...”**

LTGEN VAN RIPER USMC

If defense budget cuts continue their present trend, the Marine Light Attack Helicopter (HMLA) community will support the Corps of the 21st century with 1980 technology because of improper funding and wait-and-see strategies. Trapped in a decreasing Defense budget crunch, the aging fleet of HMLA helicopter's will enter the 21st century without technological enhancements desperately needed to support the Commandant's operational maneuver from the sea (OMFTS). The HMLA community continues to choose an upgrade vice replacement strategy. HMLA funding has historically fallen to the back of the line concerning congressional funding and military priorities. The UH-1N needs to be replaced, not upgraded. Money spent on the HML-60 and dollars invested now into tilt rotor technology will keep the HMLA community viable beyond the first quarter of the 21st century.

The Marine Corps UH-1N helicopter provides assault support, one of the six functions of Marine Aviation, to the ground combat element (GCE). This multi-mission, multi-functional helicopter platform provides armed escort services for ground and assault support forces. It also provides airborne command and control of assault operations, aeromedical evacuation, and coordination and terminal guidance for supporting arms to include close air, artillery, and naval gunfire. It also supports other operations not necessarily assigned as a specific mission, but unique due to the UH-1N's versatility. Designed in the 1960s and introduced to the Marine Corps inventory in the early 1970s, the helicopter never received a service life extension or upgrade program. Severe deficiencies in operational safety, performance, reliability, and maneuverability continued to highlight themselves. With the start up of the MV-22 replacing the aging CH-46, Marine Aviation envisioned the UH-1N service life ending in late 1990s. In 1985,

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Marine Corps Aviation took a new look at the future of rotary-wing aviation. The new plan, titled VMAO, envisioned the HMLA and OV-10 mission requirements merging into one single platform, possibly of tilt-rotor design.<sup>1</sup> Today, it appears that budget cuts and political maneuvering has ended that vision.

The UH-1N's retirement plan ended along with VMAO, An upgrade to the UH-1N was required. However, new upgrade programs often take time to gain a foothold in the rice bowl pecking order game of procurement politics. Failures of major UH-1N structural components added a sense of urgency to the procurement process. UH- 1N maintenance concerns highlighted by recent accidents and maintenance safety inspections resulted in a maximum aircraft gross weight reduction of 500 pounds to help restore power and safety margins. The safety issue pushed the HMLA upgrade program higher on the priority list. The AH-1W could fulfill its programmed service with only minor upgrades, but the UH-1N could not! UH-1N replacements were considered. Limited by a restricted budget account, an upgrade vice replacement strategy seemed the only possible solution.

#### **UPGRADING ON A SHOE STRING BUDGET.**

The HMLA community has always existed on a shoe string budget when upgrade or replacement issues needed attention. Manpower and equipment shortages during the early 1980s forced the Marine Corps to combined the HMA (AH-1J) squadrons with the HML (UH-1N) squadrons forming composite helicopter squadrons called HMLA. The new squadron brought together similar capabilities, training requirements, personnel manning, and airframe commonality into a unified command and support structure. The dramatic force savings and operational synergy achieved by this venture paid immediate dividends. Budget constraints still prevent UH-1N improvements and the AH-1W still lacks numerous essential upgrades. Today however, the latest Cobra version, the AH- 1W, has little in common with the UH-1N.

The UH-1N still remains relatively unchanged compared to when it was first put into service in the early 1 970s. Minor avionics upgrades increased aircraft weight. Improvements to structures and avionics added an additional 1000 pounds on some aircraft, yet aircraft power remained unchanged reducing performance, range, and the time it could remain on station. Increased mission requirements demanded the routine use of an internal auxiliary fuel bladder primarily designed for non-tactical ferry operations. The added fuel capacity increased range, but

decreased cabin room and reduced mission payload and lift capabilities. Mission creep increased operational tempo that put a greater demand on spare parts. Shortages soon developed in the parts inventory. The situation would culminate with a couple of aircraft fatalities. In March 1995, the HMLA community's Operational Advisory Group (OAG) proposed a reduction in the maximum aircraft weight limitation of 10,500 LBS to 10,000 pounds to regain an acceptable flying safety margin. The UH-1N would require substantial costly upgrades just to regain previously lost performance margins. The first UH-1N upgrade proposed in the 1980s provided little enhancement to the platforms overall mission and never made it out of the planning process.

Since commonality between the AH-1W and UH-1N no longer existed, an independent upgrade effort began for the UH-1N called the Mid-Life Upgrade (MLU).<sup>2</sup> Submitted for final approval, the MLU died as a result of inadequate available funding and political rice bowl bickering.<sup>3</sup> In 1991, a comprehensive proposal promised to solve the HMLA upgrade dilemma. Titled the 4BN/4BW program, it promises to upgrade the two airframes enough to keep them in service through the year 2020. The new proposal restores commonality between the two airframes using common rotor blades, engines, and drive trains. The Four Bladed Whiskey and Huey (4BN/4BW) program incorporates all previously funded or planned upgrades destined for each helicopter into one comprehensive program. The upgrade program saves money because it avoids the logistic costs associated with starting up a new replacement aircraft. Most of the dollars spent go directly into hardware procurement.<sup>4</sup> Since the program involves a complete overhaul for the UH-1N, research and development testing (R & D) will absorb some of the funding. The upgrade completely rebuilds the UH-1N, the 4BW gets a major drive-train/rotor modification, Commonality between the aircraft approaches 68 percent.<sup>5</sup> (Enclosure one illustrates the 4BN/4BW improvements) The proposed cost for the 4BN helicopter hovers around \$11.1 to \$11.5 million a copy. Bell helicopter promises UH-1N fleet delivery beginning in the year 2002. The 4BN upgrade changes the UH-1N into a similar looking but radically more powerful platform. The upgrades will reset the airframe service life time clock back to zero. Each airframe is intended to provide support through the year 2020. The program ties the 4BN and 4BW together under one contract, and funding for the 4BN/4BW program awaits final approval from Congress, a process that seems to consume any HMLA helicopter proposal.

The Marine Corps passed up several opportunities in the late 1970s, mid 1980s, and early 1990s when the Army, Navy, and Air Force services replaced their aging UH-1N's with the H-60 helicopter. In the 1980s, the H-60 offered more than the HMLA community needed for a UH-1N replacement and lacked sufficient cargo capacity to replace the CH-46. Limited budget constraints prevented two simultaneous procurement replacement programs (The MV-22 and H-60). Competing procurement requirements between the F/A 18 and AV-8B, and the Army pulling out of the MY-22 program in the late 1980s quickly put HMLA airframe replacement plans on the back burner. The HMLA community began having serious mechanical difficulties with both the AH-1W and UH-1N helicopters. Once the MV-22 program received final approval from congress, the HMLA community's cry for help finally received some attention and the 4BN/4BW program began gaining momentum. However, numerous stumbling blocks still remain and may again delay the approval of an HMLA upgrade.

### **SETBACK OR OPPORTUNITY?**

Currently, the 4BW/4BN upgrade proposal for the Marine Corps UH-1N and AH-1W again stumbles in the final review process.<sup>6</sup> In August 1995, Sikorsky Aircraft delivered an unsolicited proposal to congress and DoD officials for an H-60 multi-service multi-year replacement program. The 132 H-60 helicopters buy over a five year contract provided for all the services H-60 needs and included twelve HML-60s for the Marine Corps. Sikorsky's proposal promises to meet the Marine Corps maritime requirements, brings commonality to all the services, and supports cost reductions associated in producing a new helicopter for the Army called the Comanche. The HML-60 costs around \$12 million per copy.

Sikorsky's proposal provides the Marine Corps with a similar capability in comparison to the 4BN while bringing about DoD's desire to bring commonality between the services. Placed side by side, each type airframe offers comparable performances. The HML-60 costs about \$500,000 more per copy than the 4BN. Both easily fulfill any MAGTF mission requirement. As a modified Army Blackhawk H-60, the HML-60 is completely compatible with shipboard operations. Range, speed, and lift capabilities reflect what one would expect from an airframe slightly larger than the 4BN (4BN gross weight, 16,500 pounds and the H-60 22,000 pounds). The HML-60 provides almost twice the lift capacity of the 4BN and can carry 12 to 15 combat troops 250 nautical miles at 150 knots.<sup>7</sup> Multiple variants of over 2,100 H-60s are operating in

the military services, nine of them in service with the Marine Corps at HMX-1, Quantico, Virginia. In service with the US Coast Guard and DEA Customs, the H-60's have a proven successful track record and provide commonality between each of the services.<sup>8</sup> The Army's H-60L production initially intended to end in FY 97. However, congress directed DoD officials and the Army to fund 90 more Black Hawks over the next five years. The buy will extend Sikorsky's work until 2003 and prevent spending millions of dollars in production line shutdown and Comanche start-up costs. These types of costs are absent from the Bell Helicopter 4BW/4BN program. R & D dollars will still be spent as the new 4BN platform requires additional flight testing before full scale manufacturing. Cost saving between upgrading the UH-1N and keeping Sikorsky going until the Army's Comanche comes along could result in the Marine Corps also being directed to buy H-60's; another chance that the Marine Corps could have used to its advantage. Getting on board with programs directed and backed by Congress might be a way to increase program success.<sup>9</sup> The MV-22 and AV-8B are two examples.

## **REALITY**

Sikorsky's proposal appears to offer a long term solution to DoD's aviation related requirements. Congress requested the Marine Corps to provide additional information on the H-60/4BN question. A DoD *Quick Study* looked at production costs, power requirements, aircraft performances, personnel, follow-on support operations and maintenance, and other areas underwent study by civilian contractors and DoD personnel. The paragraph below summarizes the Quick Study findings:

The DoD Quick Study determined that the 4BW upgrade will continue regardless of events concerning the UH-1N. DoD, Bell Helicopter, and Sikorsky figures differed and a fly-off between the two proposals could reduce costs, but no recommendation to do so was made to the committee. Operational and logistical service estimates and initial acquisition costs favored the 4BN. The H-60 performance and endurance characteristics were similar to the 4BN. Both helicopters exceeded the Marine Corps requirements for a Utility helicopter. The 4BN cost less than the HML-60 and purchase requirements for the additional 98 helicopters needed to replace the current UH-1N fleet required additional contracting and those costs were unknown at the present time. The DoD studies concluded that follow-on support costs for the HML-60 were

slightly more than the 4BN. The difference in dollars between the two types was the deciding factor and favored the 4BN. The AH-1W proved itself in Desert Storm. Since the study proclaims that the 4BW will be upgraded regardless, its discussion will end here, but remembered as a part of an integrated package. The UH-1N/ 4BN future is still unknown. The Marine Corps remains committed to the program because the Marine Corp Aviation budget will not support a buy of 110 HML-60 helicopters. The 4BN appears to be the right answer for the Marine Corps because of limited funding.

DoD recommends the 4BN based on cost; the 4BN package recapitulates the aging H-1 fleet by zeroing the operating time on 280 aircraft. Helicopter commonality in the HMLA community increases. The 4BN's bigger engine and improved drive train promise more power and greater maintainability. The 4BN program focuses on recapitalizing 110 UH-1N helicopters. Sikorsky's original proposal reflected a broader view, incorporating all DoD H-60 helicopter requirements into a single comprehensive plan. Sikorsky's proposal focused on future growth possibilities of the H-60. This brought little attention in the DoD quick study. Most all of the reports focused on operational costs and performance comparisons, and the ability of the platforms to meet current requirements. Sikorsky's proposal increases cost savings through implementing commercial practices instead of *DoD business as usual*, and recapitalize the entire DoD H-60 fleet. As both the Navy and Air Force H-60 fleets begin needing some kind of service attention soon, combining all DoD helicopter requirements into one package deal seems to have merit. Any deeper study seems unlikely. The Air Force is just beginning to look at its H-60 requirements, but waiting for an analysis would stall the current programs even further. The HML-60 meets the Marine Corps commonality requirements with similar avionics and powerplant packages. The government furnished avionics package scheduled for the 4BN will fit the HML-60. The T-700 engine is common to both Bell and Sikorsky helicopters. Funding for the H-60 already exists and procurement continues; the 4BN remains unfunded. The H-60 design easily accommodates an offensive capability; the 4BN design lacks an offensive capability.<sup>10</sup> Clearly the driving factors in this study were focused on cost and performance alone with no concern for future commitments or platform requirements. Additional dollars spent now could provide greater returns later on. The 4BN decision still awaits final approval. The bottom line remains that limited funding provides limited procurement. The DoD *Quick Study* recommended

the 4BN program and that may signal the end and loss of another opportunity for HMLA. There comes a point where old ideas and newer technology do not fit together. Technology has a way of advancing to a point where older systems will not integrate with newer ones without incurring greater cost to make them do so. The 4BN seems headed down that road.

## **ALL SHOW, NO GO**

Mission performance can suffer as restricted procurement policies deny needed enhancements. Funding constraints for HMLA upgrades put the HMLA community way behind in the technology arena. Weak DoD budgets and reductions in military spending will continue to delay additional upgrades for Marine helicopters. The MV-22, AV-8 remanufacture/upgrade, and F/A-18 E/F continue to consume limited Navy/Marine Corps Aviation funding resources. Stealth engineering, advanced weaponry, and command and control (C2) technologies now available and being used in other services' platforms remain out of reach for the limited 4BN budget.

One mission assigned to the 4BN/H-60 utility platform is control of indirect fire assets (Close Air Support, Artillery and Naval Gunfire). Budget restraints prevent the purchase of a laser designator for the UH-1N so essential for the control of smart weapons. No funding exists in aviation or ground budgets to produce a C2 dedicated radio communication package. The UH-1N ASC-26 radio communication set, used primarily by the GCE, is almost as old as the helicopter design itself. The outdated package has no data link, satellite communication, or even communicating beyond line-of-sight capability. Navigation systems, position location equipment, quality forward looking infra-red (FLIR) devices, identification friend or foe (IFF) transponder, and a slew of other systems that provide a giant leap in operational capability remain in the "hope to buy them later category." Funding restrictions prevent the 4BN upgrade from having an integrated weapons capability. The 1970 designed defensive armament system (DAS) currently in use with the UH-1N remains the only system scheduled for the helicopter. 4BN funding cannot afford the incorporation of an inexpensive air defense system like the Stinger Missile, and will never shoot a Hellfire or Tow, even though the UH-1C single engine model of the Viet-Nam era was the first dedicated TOW capable helicopter platform. 4BN pilots will still shoot 2.75 rockets relying on their best Kentucky windage marksmanship. The 4BN will get to the fight quicker than the HML-60, but provides little in the way of offensive fire support.



Can the Marine Corps afford to procure a helicopter platform that cannot provide an affective offensive punch? At least the H-60 series design supports an integrated weapons capability.<sup>11</sup>

The 4BN upgrade increases performance, but provides no advance in safety features; an issue that helped initially highlight the aging UH-1N. The 4BN does not address the survivability and crashworthiness issues associated with the basic design of the helicopter. Proximity of the engines still leaves the ability of one catastrophic engine failure to affect the other engine. There are no ballistic improvements in the pilot or engine cabin area, and no funding exists to provide a crashworthy seat for the pilots or aircrew. These requirements are standard equipment in the H-60 design. If the 4BN is an economy measure to fulfill a current need until something better comes along, future procurement requirements will make replacing the 4BN almost impossible.

### THE PROCUREMENT BOW WAVE

Upgrade programs often end up delaying necessary replacement programs. The Bow Wave, well known to program managers, represents a criticle period of increased funding requirements in the early 21<sup>st</sup> century. HMLA's 4BN/4BW proposal and joint replacement aircraft (JRA) program attempts to bypass the increased procurement period depicted in figure one.<sup>12</sup>

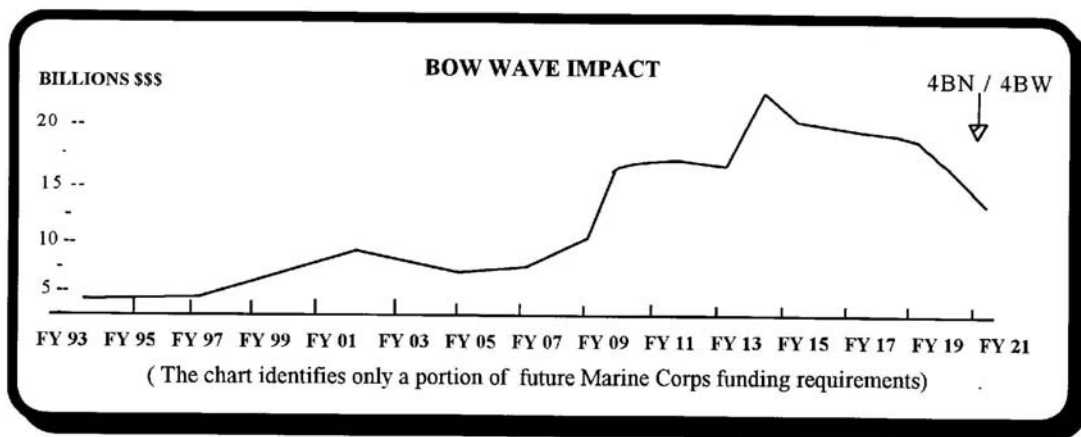


FIGURE ONE

The Bow Wave represents only a portion of Navy and Marine Corps Aviation requirements. The age of current Navy and Marine Corp aircraft in FY 2020 will average about 17 years.<sup>13</sup> If traditional roles and missions assigned to Marine aviation remain the same, some

4BN helicopters might approach their 20 year/10,000 flight hour expected service life. Any replacement or upgrade proposal will compete with other services' needs as well as the Corps' requirement to upgrade or replace MV-22's, F/A 18's, CH-53 and 4BW helicopters. Throw in a few munitions and GCE vehicle requirements and watch the wave grow! Replacing a new 4BN helicopter during the height of the Bow Wave period seems only a remote possibility at best. Regardless of airframe age, trying to upgrade or replace any Marine helicopter during the Bow Wave will compete with more programs than it faces now.

If jointness and service commonality are the sound-off from Congress, the 4BN upgrade is sending the wrong procurement signal and going in the wrong direction. Attempting to put off programming for a replacement airframe until better times and spend scarce dollars on an antiquated system now mortgages away HMLA's future. Granted, the decreasing Defense budget requires recapitalizing older systems, but only systems that provide a long term improvement capability with potential for further growth should be considered. Upgrade strategies work as long as the basic design can support future improvements. Once that point is past, replacement or retirement becomes the only reasonable option. The decision to upgrade or replace the CH-46 exemplifies this point. As the MV-22 program seemed doomed by increasing DoD budget requirements and decreasing support, program managers debated building a new CH-46! Stretched to its maximum limit by service life extension programs (SLEP), the fuselage structure no longer supported the extensive upgrades required to significantly increase its performance or range. Although improved, the new version would not provide any advanced capability required by current Marine Corps doctrine. The CH-46 mission remained valid so a replacement strategy became the only solution, The UH-1N mission today is just as valid and remains. Upgrading the UH-1N gives it greater range and capability, but the new airframe uses an old design, already outdated and incapable of operating in tandem with the MV-22. Lacking speed and a sufficient GCE C2 support suite, the 4BN barely supports the commander on the ground. The 4BN fails to take the next step in meeting the future needs of the Corps and only *keeps the ball rolling*. It may look new and have more power, but it is still a UH-1 in design.

The OV- 10 retired after the Gulf War and its mission migrated into the HMLA and fighter attack communities. The HMLA community envisioned replacing three aging airframes (OV-10, AH-1W and UH-1N) with one airframe; a sound and cost saving strategy. The program,

called VMAO, died because of DoD budget crunches and competing priorities that continue today. Therefore, the prospect for the Marine Corps to be able to *go-it-alone* in developing a new replacement aircraft for HMLA seems very remote and DoD's jointness mandate will not allow us to do so anyway. However, teaming up with another service for procurement can have major drawbacks. The MV-22 program, of which the Marine Corps is the primary customer, almost crashed when the Army backed out. Under austere conditions, upgrading the UH-1N appears to be the only answer.

Undoubtedly, the 4BN provides an affordable capability, but at a cost that mortgages future helicopter replacement programs. The Marine Corps aviation plan proposes to replace the F/A-18 Hornet and AV-8B Harrier with the short take off and vertical landing (STOVL) variant of the joint aircraft strike fighter (JAST) now on the drawing board. If the F/A-18 replacement JAST program incorporates a multi-functional modular design structure that easily supports modifications, HMLA may have to settle for the JAST design as a JRA replacement for its aging fleet whether it meets all the mission requirements or not. With VMAO dead, the HMLA's unidentified IRA replacement needs identifying before FY 2010. Since no helicopter envisioned today will keep pace with the MY-22, the HMLA JRA will need to be a platform already in development, otherwise any new design will fall into the lengthy procurement purchasing, test, and evaluation process that often fields systems reduced in numbers, capability, and delivered later than planned.

Currently, JAST (fixed wing replacement) and JRA (helicopter replacement) are separate aviation community program paths, but congressional mandates my force them to merge. Air Force and Army replacement needs increase the Bow Wave when F-16, older F-15's, and the aging CH-47 helicopter approaches the end of their service life. Throw in JAST, a few ships, subs, and bombers, and you can understand DoD challenges in FY 2020. Only the most critical DoD programs will receive DoD funding. All others will face being upgraded or canceled. During the Bow Wave period, something has to give. Historically, Marine helicopter programs have remained on the bottom of the priority list. It is easy to conceive that any system not upgraded now will also add to the bow wave impact and require additional upgrades to extend service life beyond FY 2025, the time that HMLA attempts to field its replacement airframe. If this happens to the 4BN in FY 2020, HMLA will be faced with a dilemma similar to what

Commodore computer users face now, incompatibility! The HMLA community must stand up and begin programming a replacement aircraft now, but the 4BN prevents this path from maturing.

Current and future helicopter replacement programs under development far exceed the fiscal realities of the Corps today and tomorrow, as the Bow Wave firmly demonstrates. Comanche, Apache, and the HML-60 all fell victim to the budget ax. For HMLA, upgrading the 4BN/4BW seems the only possible course of action. However, as an upgrade, Bell Helicopter's 4BN proposal rebuilds the airframe from the ground up. As a new helicopter, it will require the spending of procurement dollars for R & D testing before fielding, money better spent on a system already fielded and more advanced. If the Bow Wave becomes a reality in FY 2020, then the sixty year old design 4BN replacement will have to provide service beyond FY 2020. By that time, many MV-22s will be 15 years old or older! The 4BN production will continue through FY 2010. If replaced in FY 2020, many of the airframes may retire with half of their service life unused. If low rate production and fielding continue, the 4BN may still be in service well beyond FY 2025. The 4BN design will be 65 years old! Current operating tempo experienced by the HMLA community will have to deal with the additional headache caused by slow production rates.<sup>14</sup> If budget constraints prevent replacement strategies and upgrades fail to meet the necessary standards for future growth and compatibility, where can the HMLA community turn for the answer to the aging UH-1N problem?

## **THE SOLUTION**

If the Bow Wave effect follows its projected course, replacing the UH-1N with the HML-60 provides greater capabilities and has greater potential for further growth. Sikorsky's proposal attempts to highlight the larger replacement potential of all the services' H-60. History has shown that service unique solutions are expensive. They are difficult to press through congress as *piecemeal* type programs. They increase future costs while robbing dollars better invested in R & D programs. The HML-60 is a proven design and in use by DoD, civilian, and military organizations. The HML-60 addresses survivability and crashworthy issues lacking in the 4BIN airframe design.<sup>15</sup> The H-60 integrates crashworthy break-away drive-train system and superior structural integrity in the crew and passenger cabin area. The H-60 special operations

and search and rescue aircraft incorporate sophisticated avionics and integrated weapons systems. Additionally, the H-60 can incorporate an air refueling capability. The HML-60 advantage focuses on its lift capacity and growth potential. The HML-60's larger cargo area and greater lift capability could reduce the total number of aircraft currently required in the HMLA inventory by one third. One HML-60 can carry a reinforced Marine Rifle Squad (15 passengers). It takes two 4BNs to do the same job. The future flexibility offered by the HML-60 in a *maneuver from the sea* environment is obvious. Sikorsky's proposal costs more than the 4BN replacement. The future potential of the HML-60 easily justifies the additional dollars required to field it. Additionally, the H-60 is in production now and Sikorsky could deliver the Marine version at the turn of the century, two years sooner than the Bell 4BN.

Extremely flexible, cost cutting upgrade strategies provide cost savings by recapitalizing existing programs. The 4BW provides more bang for the buck, but the 4BN, although noteworthy if fielded ten years ago, comes too late with too little. The HMLA leadership must begin to lobby for a replacement program, but the decision for change has to come from the top down to overcome service rivalry and departmental rice bowls. The time is right, but lobbying for the current proposed upgrades and taking a back seat to procurement and R&D programming is sending the wrong signal to congress. Upgrading existing airframes when they need replacing is not an acceptable alternative.

The best answer lies in tilt rotor technology, and the evolution of HMLA and HMM squadrons into one integrated unit. This solution to the paradigm incorporates all the concerns faced by the HMLA community and mandated by congress. In the short run, it obviously costs more as well. If HMLA allows the UH-1N to complete its original programmed service life, some airframes begin in FY 2002, then procurement efforts could focus on a synergistic replacement strategy that incorporates commonality of systems and cost savings while aligning with capabilities just entering fleet service.<sup>16</sup>

Focusing on tilt rotor technology takes advantage of R&D money already invested. The tactical tilt rotor (TTR) proposed by the Bell-Boeing team in 1988 might be one answer. If funding projections continue to decrease as expected and the Nation's deficit remains high, military down-sizing could continue, Military budgets may also continue to decrease. Marine Aviation cannot afford to build a system with limited growth potential and no offensive fire

support capability! The MV-22 goes to the fight without any offensive capability, thus another aviation platform must provide the offensive firepower. The Marine Corps' neck down strategy, services required from many different airframes provided by one airframe, is trying to cut down on the different types and numbers of platforms it already has.<sup>17</sup>

## **THINKING OUT OF THE BOX**

A tilt-rotor attack airframe, that incorporates MV-22 technology and takes advantage of already invested R & D dollars, seems the most logical approach to a difficult paradigm. Nothing more than an idea in the 1980s, the TTR's time has arrived. As Comanche development pushes helicopter design to the limit, Comanche remains a helicopter limited by basic design.<sup>18</sup> Tilt-rotor technology takes the next evolutionary step providing increased flexibility for both air and ground forces. Whether MV-22, or a combination of MV-22 and TTR, the capability provided by a tilt rotor aircraft could easily fulfill the Marine requirements well into the middle of the 21st century. The MV-22 provides a multi-mission capable platform that is self supporting, has potential to support an offensive strike capability, and provide firepower support to the Marine on the ground. Its potential for growth seems unlimited. Tilt-rotor, folding rotor-jet, ducted fan, or vectored thrust upgrades and modifications all seem possible. (Enclosure two)

The MVA-22 (attack version) provides a practical, dedicated support platform that binds the HMLA and MV-22 HMM community into one integrated Marine Vertical Lift and Attack squadron (MVLA). MVLA would provide close air and versatile utility support in high threat war-like environments, littoral conflicts and military operations other than war. MVLA reduces manpower requirements by reducing the different numbers of military occupational specialists, and manpower is a major expense in the DoD budget. Combining the two squadrons into one would establish a common supply, maintenance, and logistic chain, and eliminate duplicative manpower requirements and administrative procedures.

Multi-purpose airframes with a modular internal weapons capability could increase flexibility. Fewer MV-22 attack versions would replace the current 27 airframe HMLA of today with a dual purpose attack-utility platform. One platform would combine the next generation digital technology into a single procurement package with a joint support structure for all the services. An armed MV-22 platform could launch off a carrier with Marines on board, fly 300 miles or more and drop its troop payload in an unprepared landing zone and provide close air

support. The MV-22's range allows it to remain on station, retrieve the combatant force from one unprepared zone, then aerial refuel enroute to another hot spot without returning to the ship or airfield to refuel or re-arm. That is flexibility! Arming the MV-22 is only a matter of will and the internal capacity of the cargo area lends itself to all sorts of possibilities.

If embraced now by the DoD, HMM and HMLA squadrons could begin transitioning to MVLA shortly after MV-22 full rate production begins in FY 2002. Pilot and aircrew reductions and personnel transitions also coincide with the ending service life of HMLA platforms.<sup>19</sup> Additionally, commitment to the MVLA idea now allows time for further MV-22 R & D, and avoids the crash projected by the Bow Wave in the year 2020.

## **CONCLUSION**

Solutions often require great compromise when budget constraints limit procurement. Unfortunately the military philosophy of use it or lose it still exists in the highest levels of the procurement process, and powerful military lobbyists will continue to pull the acquisition programs in different directions. The best answer to the question of upgrading or replacing the UH-1N is not an easy one. If money is the only concern, the 4BN is the obvious winner. However, if we follow the guidance given by Lieutenant General Van Riper, the HML-60 is a better answer. It provides what the Marine Corps needs and its growth potential far exceeds that of the 4BN. The HML-60 goes against the Marine Corps' neck down strategy, but clearly makes up for that shortcoming because of the platform's, flexibility, growth potential, and commonality that interfaces with all the services. The best solution remains investing now in tilt rotor technology, but is the wrong answer at the current time in the fiscal budget process. The Bow Wave clearly points out that there may never be a good time in the future fiscal cycle. Clearly, of all the programs currently on the drawing boards, tilt rotor technology promises to provide the greatest service well beyond FY 2020, and seems to promise the greatest return for the investment. However, other major programs would suffer if the focus of effort went in that direction, and political rice bowls seem impossible to overcome at present. The MV-22/tilt rotor answer requires short term sacrifice and long term dedication. The type of dedication demonstrated in the procurement of the CH-46 replacement, the MV-22. The Marine Corps fixed wing community got on-board with the Navy and the F/A-18 procurement package back in the 1980s. The F/A-18 package will provide capability that will serve the Corps well into the 21st

century. Tilt rotor technology can provide the same total package if only the helicopter community can get focused on the long term commitments facing the United States military today.

Current budget constraints seriously question the validity of producing aircraft without a multi-role, offensive capability. Tilt rotor technology promises a platform that can shoot, transport logistics, loiter, provide C2, and survive in the digitized information hungry battlespace of the 21st century. Because of funding constraints, HMLA will field the 4BN/4BW platforms at a slow replacement rate with piecemeal additions that already face over-tasked commitments. Procuring platforms with limited growth potential wastes valuable procurement and R & D dollars. It will take top down leadership to stop this trend. As long as the HMLA community continues to demonstrate its willingness to patch up the old vice buy new, it will continue to send the wrong message to congressional leaders...that we can continue to make it happen and get buy on what we have! A serious look at the near future points to a precarious time for the HMLA community and others as well. Whether DoD budgeteers like it or not, the time is coming when the HMLA platforms will need replacing. The longer one waits, the more a replacement platform will cost. No matter what happens in FY 2020, upgrade or replace, any program will have to compete against big ticket priorities. Somehow, the hard working Marines in the HMLA community will continue to make it happen. An investment today in the HML-60 or tilt-rotor technology is an investment that promises big dividends. Each has the potential to carry the helicopter light attack community to the year 2025 and beyond. History shows that things only cost more as time passes. DoD's past track record of buying from the lowest bidder and on a limited budget has provided a get what you pay for legacy. The first UH-1Ns were delivered to the Army at a cost of around \$500,000 dollars a copy. That same design, marginally improved, may cost the Navy \$11.5 million a copy in the very near future. It will fly faster, go a little farther, and carry a little more weight than its predecessor, but the advantages end there. As the Commanding General of Marine Corps Combat Develop Command, General Van Riper has stated many times, *"We are almost out of money... therefore we must think!"* Procuring HMLA platforms designed without a multi-role capability and limited growth potential seem contrary to the future needs of the Marine Corps. A Corps faced with increasing commitments, tighter budgets, and aging hardware.



## FOOTNOTES

<sup>1</sup> LAN interview with Col J.P. Sexton (Ret), 8 Dec, 1995.

<sup>2</sup> The HMLA Composite configuration increased operation capabilities while saving manpower and money. Commonality between the two airframes was very high between the old AH-1J, but that quickly changed. The AH-1T (TOW) and current AH-1W increase the commonality gap even further. Funding programs for both helicopter operated as separate entities, competing against one another and other programs.

<sup>3</sup> Known as the Mid Life Upgrade or MLU, the proposed improvement was not cost affective and only marginally increases operational performance. The proposed engine upgrade would be different from those now operating in the AH-1W. A integrated Avionics support package greatly reduced pilot workload and increased survivability, however, aircraft basic weight increases again chipped away at power margins. This proposal would diverge from the effort to make the community more common, but it was the only affordable answer at the time. Little support and money existed to conduct a major airframe upgrade as the Marine Corps still struggled with the MV-22 program.

<sup>4</sup> Logistic support includes such things as field service support, trainers, training courses, etc. Cost analysis completed by APW-HQMC was compared to Bell Helicopter's cost analysis. Difference between the two estimates occurred, but each supports the findings.

<sup>5</sup> Program managers update given at Quantico Va., November 1995, at the Quantico Golf Course club house.

<sup>6</sup> At the HMLA 3rd annual Commanders' and Operational Advisory Group (OAG) Symposium in March, 1995, the CG 4TH MAW, MGEN Taylor, identified the 4BN/4BW as one of the top reserve priorities for the total forces Reserve component. The 1995 HMLA GAG unanimously supported the current proposal for upgrading the airframes.

<sup>7</sup> Mission gross weight and operational weight computations varied, the differences and specifications depend upon aircraft configuration. The HML-60's larger cabin area allows for 4 more troop spaces and three Crew Chiefs /Gunners for a total of 15 as compared to the 4BN's nine plus two Crew Chiefs/Gunners for a total of 11. More importantly however, the HML-60 incorporates external fuel tanks do not compete with internal cargo space. The 4BN has only internal fuel bladders. Although wider than the 4BN, the H-60 takes up 15 percent less deck space because of a folding tail section. Airspeed and climb performances in average temperature settings are relatively similar. The HML-60 is a current production initiative and not upgraded whereas the 4BN is a new helicopter of 1980's technology design.

<sup>8</sup> APW and NAVAIR, Navy Annex, HQMC, Washington D.C. Avionics and engines will be the same and the successful safety record of the H-60 is well documented and currently better than the UH-1N.

<sup>9</sup> Both the MV-22 and AV-8B upgrade received congressional support even when the Secretary of Defense John Chaney decided not to go ahead with either program. Other higher prioritized programs received less funding so both could continue and congress appropriated additional money as well.

<sup>10</sup> The Navy Search and Rescue HH-60 helicopters and U.S. Army Special Operation Units H-60's operate with an extensive offensive weapons capability including rockets, TOW and Hellfire missiles. These capabilities are not included in the Sikorsky proposal.

<sup>11</sup> Sikorsky advertises a weapons capability for the H-GO. It was not included in the Marine Corps proposal.

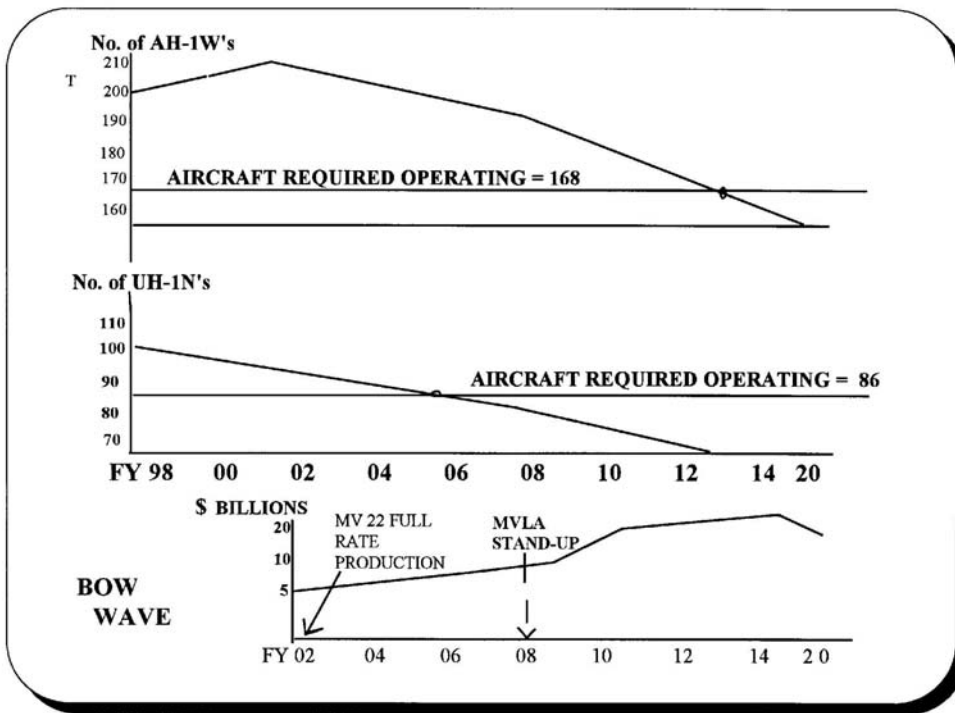
<sup>12</sup> Appropriations and Weapons, Head Quarters Marine Corps, Washington D.C. Dec. 1995.

<sup>13</sup> William I. Perry, Secretary of Defense, Annual Report to the President and the Congress, March 1996. pg 179-182.

<sup>14</sup> A recent Marine Corps Manpower report identified the HMLA community as experiencing the second lowest manning in Marine Aviation with the highest operational tempo. At the same time, the VMO - OV-10 mission has migrated into the HMLA mission requirements. Shortages in parts in the supply system and fewer airframes to rotate through the flight schedule will have a direct impact on aircraft availability similar to the AH-1W program now.

<sup>15</sup> Sikorsky's initial proposal also identified the 4BN deficiencies. Crash-worthy seats were cut from the 4BN upgrade due to costs. The proximity of both T-700 engines increases the chances of a catastrophic failure from one engine damaging the other. The 4BN and 4BW engines are separated by a thin honeycomb aluminum panel, the H-6O engines are spaced farther apart. Energy absorbing landing gear, gearbox, engines and other high mass items enable the H-6O main cabin area to remain intact in most crash simulations other than catastrophic.

<sup>16</sup> The graph on the next page identifies an ideal period for MV-22 integration and UH-1N retirement beginning around FY 2008. Logistics and training support, and Pilot and Aircrew conversion all easily coincide with the UH-1N retirement as well as MV-22 integration. One support base with centralized logistics and unified mission requirements eliminate the multiple channels and support and training requirements currently on-going to support two different communities. The time also supports an HMLA one-for-one airframe replacement. Additionally, this period establishes the transition process well ahead of the Bow Wave, bypasses the lean years of procurement, and gets the most out of the airframes already in service.



<sup>17</sup> The Marine Corps aviation neck down strategy replaces six type/modle/series platforms with three. The CH-53 remains, the OV-10, UH-1N and AH-1W get replaced with the VMOA platform (TBA), and the CH-46 and CH-53 A/D get replaced with the MV-22. The H-60 adds another t ype helicopter when Marine aviation desires commonality. The H-6O provides more commonality between the other services than the 4BN.

<sup>18</sup> The basic limitation of any helicopter is the rotation of the rotor blades. As a helicopter increases forward airspeed, the forward rotation of the advancing rotor blade also increases. (Rotor RPM + aircraft speed — true rotor forward airspeed) The helicopter becomes unstable at a point when the advancing blade reaches MACH speed causing severe vibrations and the retreating blade develops lift causing the aft portion of the helicopter to tip forward. Also, the pitch of the rotor blade can increase to a point that it actually stalls and ceases to produce lift. (Increased blade pitch corresponds to faster speed or quicker lift).

<sup>19</sup> Data provide by APW HQMC, Jan 96. The UH-1N information is based on 1.6 % and AH-1W based on 1.9% attrition, both have a 10,000 flight hour service life. FY 2020 provides little relief in the budget and that is where the replacement proposal for HMLA helicopters takes place. Beginning in FY 2002, minimal infrastructure and reorganizing turmoil would occur as the number of UH-1N began to and MV-22 increased. Pilot and personnel attrition would occur gradually with the reducing number of airframes while new replacement aircrew would begin learning the new systems sooner and with little lag time between the delivery of MV-22's.

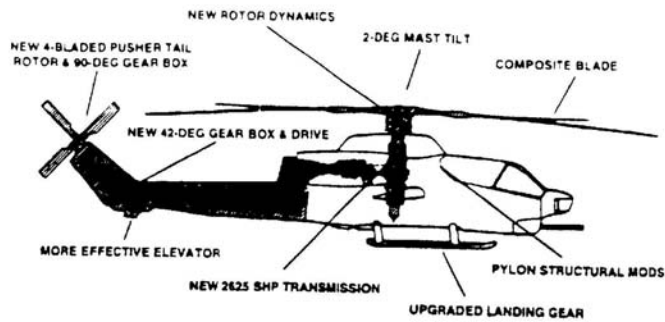
## BIBLIOGRAPHY

- Glashow, Jason, and Holzer, Robert. "DoD Eyes Black Hawk Buy vs. Huey Upgrade for Marines" Defense News 16-22 Oct. 1995: 22.
- Hoar, J. P. GEN USMC. "CENTCOM, Ready for any Eventuality in an Uncertain Era." Amphibious Warfare Review No. 2, Fall 94: 10-13.
- H-60 Multi-Service Multi-Year Utility Helicopter Program United Technologies Sikorsky Aircraft. 31 Aug. 1995.
- Mazarr, Michael J. "The Revolution in Military Affairs: A Framework for Defense Planning." Strategic Studies Institute. U.S. Army War College. 10 June, 1994.
- McKenna James T. "First Flight Boosts Comanche Program." Aviation Week & Space Technology 15 Jan. 1996: 45.
- Naylor, Sean. "Acquisition Shortfall Puts U.S. Troops at Risk" Defense News 16-22 Oct. 1995: 48.
- Program Update. 4BN and 4BW Upgrade PMA -276 Aviation Branch, HQMC. 12 Dec. 1995.
- Santo-Donato, Arther. "Defense Acquisition Work-force Improvement Act: What is it and Where is it Today?" Strategic Studies Institute. Army War College. 1992.
- Tactical Tilt Rotor Proposal Bell Boeing Tilt Rotor Team. Texas: 1988.
- Third Annual HMLA Commanders & Operational Advisory Group Symposium California, MAG 39 Camp Pendleton. 9 Mar. 1995.
- Wode, C. M. CMDR. "Operational Maneuver From The Sea." Amphibious Warfare Review No.2 Fall 94: 45.

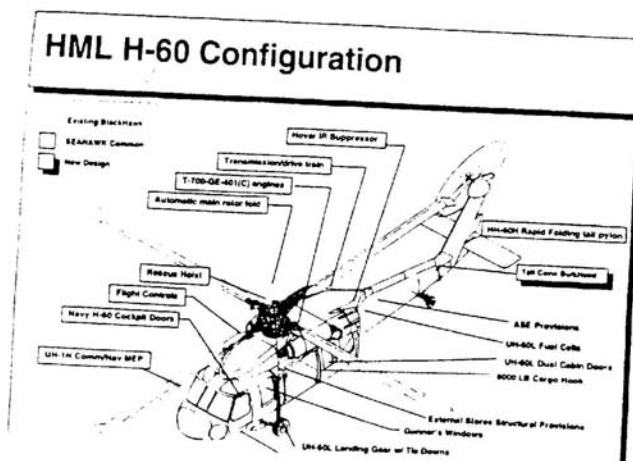
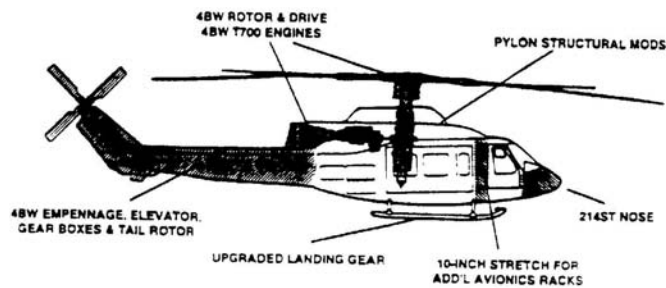
## INTERVIEWS

- Hildreth. Col, Personal Interview. Jan. 1996.
- Sexton J.P. Col. (Ret), USMC. Personal Interview. May 1995.

## 4BW



## 4BN



(Enclosure 1)

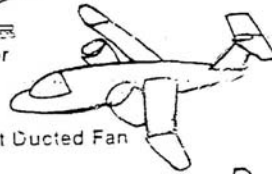
## Advanced Technology Configurations



Tilt Rotor



Folding Tilt Rotor



Tilt Ducted Fan



TRC



Vectored Jet

(Enclosure 2)