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SECTION IV – Vietnam Helicopter Maintenance Operations

by Joe Hardy

In keeping with the traditions set by past VHPA Directories, the Directory Committee presents a few pages to support the theme of this edition – A Brief History of Vietnam Helicopter Maintenance Operations. Due to page limits, only a portion of this material is printed in this paper edition. The complete History Section of 85 pages including pictures is on the CD edition of the membership directory and on the membership directory web site at <https://directory.vhpa.org>

We last dedicated the Directory Theme and History Section to Helicopter Maintenance in 2002. The 2002 article was well before the VHPA had a robust website for online storage of our collective memories, and the printed directory was page limited. This article is an expansion to the 2002 writings and where we found additional information we have updated the original text. Extracts of this 2013 article are contained here, but the full text and photos are in the CD and online versions.

We gratefully thank Joe Hardy and his wife Carla for preparing this year's history article. Joe accepted the challenge from Mike Law and Gary Roush just a week before the Reunion in San Francisco and we gave him only 30 days after he returned from the Reunion to prepare this article. What follows are Joe's words as proofed and edited by Carla.

The following five pages are an extract from the full history. The goal in selecting these five pages is to present the reader with samples for the 85 page history to display the "richness" of the material in the full history.

A Brief History of Vietnam Helicopter Maintenance Operations

by Joe Hardy

Helicopter Maintenance Organizational Structures:

The Early Years:

No discussion of Vietnam helicopter maintenance history is complete without first looking at the early years and how policy and doctrine evolved. For completeness and to show how the Vietnam buildup affected helicopter maintenance the following discussion includes aircraft maintenance operations worldwide before we drilldown to Vietnam.

With the creation of the US Air Force in 1947, one would think aviation activities would be severed, with each Service going its own way. Not so. The Air Force continued to procure Army aircraft and to train Army pilots. Aircraft maintenance was transferred to the Army's Ordnance Corps because maintaining a helicopter or airplane is pretty much the same as maintaining a truck --- right?

Department of the Army General Order 76, dated 11 August 1952, transferred a major portion of aviation logistical responsibilities from the Ordnance Corps to the Transportation Corps. Organizational maintenance became the responsibility of the using unit with technical supervision from the Transportation Corps. The Army activated theater army aviation maintenance (TAAM) companies specifically to provide helicopter maintenance support. One company was normally assigned per corps for a total of three companies per field army. TAAM companies also recovered aircraft from the combat zone and provided replacement aircraft to using units. Continued on web site....

Growth of Aviation Logistic Support in South Vietnam:

From an austere beginning when two helicopter companies arrived in Vietnam on 11 December 1961, the total number of US Army aircraft increased to 510 by 1 January 1965 and then further increased to a peak by September 1969. When the buildup commenced in 1965, the US Army Support Command Vietnam had one aircraft maintenance and supply battalion (765th Transportation Battalion) to provide backup direct and general support for all Army aircraft in-country. This battalion was located at Vung Tau and consisted of direct support companies and one general support company. The three direct support companies were located at Vung Tau, Saigon, and Nha Trang. They provided backup support for separate aviation companies having their own organic or attached direct support and they provided direct support for small aviation detachments that lacked this capability. Continued on web site....

Vietnam and Rapid Expansion of Aircraft Maintenance Units:

"Necessity is the mother of invention." The rapid expansion of Army aviation to meet the demands of combat in Vietnam meant new tactics, techniques, and technology to fight a stubborn enemy. Aircraft increased in speed, load carrying capabilities, models, and cost. Gone were the simpler days of peacetime with fewer models of more easily maintained aircraft. Continued on web site....

Direct Support Maintenance Concepts:

Three separate concepts of direct support aircraft maintenance were employed in Vietnam. The infantry divisions centralized the aircraft direct support capability in the aircraft maintenance company of the maintenance battalion; the airmobile divisions centralized the capability in the transportation aircraft maintenance battalion; and the 1st Aviation Brigade company-sized units were authorized an attached direct support aircraft maintenance detachment.

Through the extensive operational experience in Vietnam, it was found that conventional unit maintenance organizations supported by centralized direct support units did not provide the desired level of availability to meet tactical requirements. As a result, various methods of maintenance support were tried in an attempt to increase readiness. The concept employed by the 1st Aviation Brigade was found to provide 10 percent higher readiness with 12 percent higher utilization when compared with units not having a direct support capability. In February 1968, as a result of an analysis made by Deputy Chief of Staff for Logistics, the Chief of Staff approved the concept of integrating the direct support detachments into the aviation companies of the 1st Aviation Brigade. The Transportation Detachment became the Systems Repair Platoon within the aviation company. US Army Vietnam was also requested to apply the concept to the infantry and airmobile divisions. Continued on web site....

The Final Years:

In 1973 as the war in Vietnam was winding down, the Army decided to compress aviation maintenance into three levels. The first level was Aviation Unit Maintenance or AVUM, performed within the using unit and incorporating some of the work previously done at the DS unit. Aviation Intermediate Maintenance (AVIM), performed by TC units, combined DS and GS maintenance. The depot level remained what it had been. The differences rested on the cost and sophistication of the tools, test equipment, and skills of people at each level. Continued on web site....

The Vietnam Environment was a Significant Maintenance Challenge:

Never before had the Army's logistic system been tasked with the mission of supporting large numbers of ground combat troops operating in a counter-guerilla role with a pipeline 9,000-11,000 miles long. The logistics doctrine developed as a result of years of experience in conventional ground warfare was not always applicable in the Vietnam environment. Many of the techniques and assumptions which were accepted as valid in conventional warfare did not apply in the harsh, primitive, jungle environment and the isolated support enclaves. Even so, Vietnam is a story of remarkable logistics achievement. At no time was logistic support a constraint on a major tactical operation. This record was made despite the conditions that imposed a fantastic strain on logistics operations and which offered an enormous challenge to all logisticians.

Bordered on the west by Cambodia and Laos and on the east by a seacoast of approximately 1,500 miles on the

South China Sea and the Gulf of Thailand, the Republic of Vietnam extends in a crescent shape along the southeastern side of the Indochina peninsula. The land area is dominated by a mountain chain, extending southward from the republic's northern border to within 60 miles of Saigon, with peaks ranging in height from 2,000 to 8,000 feet. The overall topography of Vietnam comprises jungles, deltas, swamps, plains and mountains. The Mekong Delta, southwest of Saigon, is a vast alluvial plain fed by the many mouths of the Mekong River and crisscrossed by a dense network of canals. The Delta is one of the major rice producing regions of Southeast Asia. The topography of Vietnam created many difficulties for US Forces, hindering such activities as construction, transportation and communications while, at the same time, facilitating the enemy's type of operations.

The climate of Vietnam is tropical and subject to monsoon rains. There are two seasons: hot and dry, and hot and rainy. Highest temperatures and humidity are experienced in the southern delta in April and May, with the rainy season beginning in late May and continuing through September. In the coastal and highland areas the highest temperature and humidity are experienced during the months of July and August, with the rainy season beginning in October and continuing through March. In the highland areas the nights are cool regardless of the season. Overall, the climate of Vietnam severely hampered all logistical operations. Continued on web site....

The Maintenance Mission:

Quantifying the Workload:

Table 1 shows the Army helicopter flying hours for the eight year period from 1966 through 1973. As explained later, flying hours before 1966 are not available. Column 2 (Number Acft) is the number of each type Army aircraft deployed in Vietnam for the period. The total 9,694 includes replacements for those lost in battle and accidents. Column 3 (Hours Flown) is the number of helicopter hours for the period.

Model	Number Acft	Hours Flown
AH-1G	783	1,038,969
CH-21	6	327
CH-47	650	800,391
CH-54	57	41,860
OH-13	213	95,417
OH-23	198	63,611
OH-58	315	295,394
OH-6A	1,364	1,214,780
UH-1	6,108	7,533,590
Totals	9,694	11,084,339

Table 1: Hours Flown by Vietnam Era Helicopters

The flight time records are from digitized data originally from the Army Gold Book. The Gold Book was a monthly record kept on all helicopters in the basement of the Pentagon during the Vietnam War. It got its name from the fact that this notebook had a gold cover. VHPA was able to get an electronic copy but the data starts in October 1966 and ends at the end of 1975; therefore, we are missing the early years of the war. VHPA has records of 11,827 helicopter tail numbers that flew in Vietnam including 5,086 that were destroyed. As stated earlier here, some sources put the peak at 4,288 authorized helicopters in Vietnam so there are significant differences in the data. VHPA discovered holes in the Gold Book data. We know this because we have three other sources for tail number data. One is the Defense Intelligence Agency helicopter loss database. The second is Army helicopter accident database from Fort Rucker. And the third is the HELODAB database from the Joints Services organizations at Wright Patterson Air Force Base in Dayton, OH that was formed to investigate helicopter survivability. But comparing the Gold Book data with the other three provides the additional tail numbers. Realizing that the period of the Vietnam War was the beginning of computerization; all four databases have errors and omissions - probably due to data entry errors. For this article we will use the data in Table 1 as the best available.

With eleven million plus hours flown during the period, in simple averages the Army was flying 1,385,542 hours per year or 3,796 hours per day, but the missions were not linear. The years 68-71 were far more flying intensive than others, but we have been unable to find true flight data by year by aircraft.

There is a wide range of estimates with limited empirical data as backup for the number of maintenance man-hours per flying hour required to keep a Vietnam era helicopter mission ready. But most sources quote 4.5-5.5 maintenance man-hours per flying hour. This is for Organizational and Direct Support levels only. We have no usable data for estimating General Support and Depot maintenance time based on flying hours. Major assemblies have time change

(and overhaul) requirements based on flying hours but these vary by component. Using simple averages and the midpoint of 5.0 hours this equates to 55,421,695 man-hours expended during the eight year period for which flying hour data is available. Or as a simple average, 18,980 man-hours were required per day. However, unscheduled maintenance, such as downed aircraft recovery, battle damage repair, and premature component and assembly replacement would add another 20% or 11,210,073 hours for a total of 66,631,768 man-hours expended at the Organizational and Direct Support levels. Continued on web site....

The Maintenance Tasks:

All helicopters require scheduled and unscheduled maintenance. Scheduled maintenance, also termed Preventive Maintenance, includes inspections, fluid changes, and time based component changes. Unscheduled maintenance includes battle damage repair and premature component failure replacements.

In terms of just Preventive Maintenance, the hours flown placed a significant burden on Organizational Maintenance.

1. A Daily Inspection performed by the Crew Chief was more detailed than the pilot's pre-flight inspection. A Daily Inspection consisted of opening all cowlings and Dzus fastener access panels checking for fluid leaks, battle damage, and parts wearing or working loose. At 3,796 flight hours per day and 1.5 hours to perform a Daily Inspection, the helicopter crew chiefs expended some 5,695 man-hours each day before a flight or 16,626,509 man-hours during the eight year period for which data is available.
2. The next level of Preventive (Scheduled) Maintenance was Periodic Inspections at each 25 and 100 flight hours. For the 9,694 helicopters for which we have flight records flying a total of 11,084,339 hours, this equates to 443,374 twenty-five (25) Hour Periodic Inspections and 110,843 One Hundred (100) hour Periodic Inspections. The 100 hour inspections were more extensive than the 25 hour inspections and called for extensive removal of access panels with detailed inspection of all areas inside; fluid and filter replacement; chip detector inspections; deferred airframe crack repair; and component/assembly replacement if warranted by wear levels and other factors that may affect flight safety. These inspections were performed by a combination of Organizational and Direct Support technicians. Continued on web site....

Maintenance Operational Checks and Test Flights:

Every scheduled and unscheduled maintenance operation required a maintenance operational check (MOC) or a test flight to confirm air worthiness and that the aircraft was mission ready with all systems functional. The MOC and test flight was performed by maintenance test pilots using specially prepared checklists. The MOC consisted of a run-up to idle RPM with cowlings open. The crew chief and maintenance technicians would check for leaks and parts rubbing or chaffing. A second MOC may also be performed with cowlings closed at flight RPM or at a hover to check engine performance, blade tracking, and control rigging. In some cases, usually the 25 hour periodic inspection, only the MOC was required to clear the aircraft for mission flights. However, for the 100 hour periodic inspection or after major component replacement a test flight was required. The test flight consisted of a series of standard maneuvers to check in more detail: engine performance, blade tracking, control rigging and to resolve vibration issues. Maintenance pilots in Vietnam were not mission pilots, they spent their days and many nights on the flight line supervising crews and performing MOC's and test flights.

Although the Transportation School operated an Aircraft Maintenance Officer's Course (AMOC) to train maintenance officers and qualify them as test pilots, the number of aircraft and aircraft maintenance units far exceeded the AMOC course's capacity to provide AMOC graduates to every unit. It fell to the aviation unit commander and the maintenance officer to select, train and qualify commissioned and warrant officers as test pilots. The Service Platoon Leader, Transportation Detachment Commander (later the Systems Repair Platoon Leader) and the assigned Warrant Officer Maintenance Technicians performed maintenance operational checks and test flights. Continued on web site....

Aircraft Recoveries:

Aircraft recovery was a critical part of maintenance operations. By 1974, many thousands of downed aircraft had been recovered, repaired and returned to service.

Recoveries were categorized in three ways:

(1) Routine maintenance evacuations involving the aerial transfer of aircraft that are not operational due to mechanical failures, repairable combat damage or accidents. These aircraft required airlifting from one secured area to another for repairs.

(2) The second type of recovery was known as a field extraction and involved disabled aircraft that have been forced down beyond the safety of base camp perimeters. To keep these aircraft out of the hands of the enemy, immediate extraction was essential.

(3) Then there was the onsite field repair of disabled aircraft. Smaller helicopters like the Huey, Cobra, or Scout could

be rigged for sling-load out by a Chinook or Crane. But a down heavy helicopter cannot be simply lifted back to base. The only way to recover one of these large helicopters from a hostile environment was to repair them onsite and fly them out, or take them apart in the field and lift them out in pieces.

The best known recovery capability was 520th Transportation Battalion consolidated aircraft recovery section originally commanded by ILT Brian E. Reese. Headquartered in Phu Loi and flying under the "Pipesmoke" call sign, the men of Pipesmoke averaged 30 field extractions and 48 maintenance evacuations a month. From its initial organization in 1967, the section recovered more than 5,000 aircraft in Military Region 3, many of which were performed under the adverse conditions of enemy fire, darkness, and bad weather. Traditionally, recovery of aircraft in Vietnam was a coordinated effort between the direct support company, supplying a rigging helicopter with crew to prepare the downed aircraft for recovery, and the general support unit providing the CH-47 Chinook for the lift. The Pipesmoke recovery team was unique in that both the rigging and extracting elements were under unified operational control. This was possible due to the close proximity of the 520th Battalion units and resulted in the most efficient, best equipped, and most highly trained recovery unit in Vietnam.

Requests for recovery missions came to the Pipesmoke operations center in Phu Loi by telephone from the owning unit or by air-to-ground communication from an aircraft at the scene. The Pipesmoke crew members were briefed on the mission and prepared the necessary rigging gear and once on the scene, the recovery was made swiftly and carefully. Each man had a specific job, and in coordination with other members of the team, performed with long-practiced skill.

Outside the Pipesmoke area of operations (AO), responsibility for aircraft recoveries fell to the CH-47 and CH-54 aviation units. This writer flew several field extraction missions picking up downed Hueys and Cobras and returning them to the owning aviation unit. One particularly difficult Cobra extraction we accepted as a favor came at the end of 100 hour periodic inspection test flight and is described as a personal recollection at the end of this article. Continued on web site....

Issues Affecting the Helicopter Maintenance Mission:

Maintenance Personnel Shortages:

Qualitative and quantitative personnel problems in supply and maintenance were particularly critical for helicopters because of the nature of the materiel maintained. Chronic shortage of key enlisted personnel with critical MOS's was a matter of concern. Maintenance personnel with Military Occupational Specialty (MOS) all 68 series, 45J and 67W were always critical. Due to the special skills required, it was not possible to cross-train other skills into the helicopter maintenance skills as it was recognized that these required special training and schooling. These personnel shortages dictated that civilian contractors were used to augment the military capability in critical skill areas, particularly in the areas of sheet metal and structural repairs. Continued on web site....

Facilities Shortages:

Facilities problems associated with the support of Army aircraft were largely related to the construction of storage and maintenance facilities. Overall operation of the system was not significantly affected by port and line of communications limitations.

Some deterioration of packaging and damage to supplies occurred as a result of delays in expanding storage facilities at Saigon, but the impact was not comparable to that in the general supply depots.

Construction of aircraft maintenance facilities presented more serious problems because of the sensitivity of aircraft components to the elements. Maintenance tents provided as organizational equipment were not only short-lived in the tropical climate and expensive to replace, but generally were too small for the volume of work, resulting in a significant loss of valuable man-hours. These man-hours were consumed in moving aircraft in and out. In addition, shop vans proved too small to handle sheet metal work on bulky cowling and also for balancing blades. Construction of permanent facilities to offset these problems proved time consuming. For example, the 604th Direct Support Company moved into Pleiku in March 1966, and an adequate hangar facility for them was not completed until the summer of 1969. Although available statistics are inadequate to allow precise measurement, the weight of evidence indicated that a lack of adequate maintenance facilities appreciably degraded the efficiency of maintenance operations.

While the Direct Support and General Support maintenance units eventually had some level of covered facility to repair and test components, most helicopter line units had no indoor maintenance facilities at all. This required that all airframe inspections and component replacements occurred outdoors in the elements. Additionally ramp and revetment lighting was often extremely poor requiring line crews to work using only flashlights and aircraft cabin lights. Continued on web site....

Epilogue:

We've tried to tell the helicopter maintenance history from different points of view as it evolved over time. There is much yet to tell and we hope the VHPA will revisit this theme every few years and continue to publish increments.