# The Chinook Story

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IN 1956 THE U. S. Army announced plans to replace its piston-powered, transport helicopters with turbine-powered equipment and to develop a new multiturbined, medium transport helicopter. In September 1958 a joint U. S. Army-Air Force selection board recommended to the Army that the Vertol Division of The Boeing Company be selected to produce a new medium transport helicopter.

In less than 4 years after the go-ahead the first production Chinook helicopter was delivered to the Army. In keeping with the policy of naming Army aircraft after North American Indian tribes, the name "Chinook" was chosen for the CH-47.

Beginning in 1961 the Chinook successfully completed a series of tests which included extreme temperature evaluation, desert testing, high altitude, arctic and operational evaluations. Through extensive, successful usage in Vietnam, the Chinook has been performance and combat tested.

Since 1961 over 600 Chinook helicopters including "A," "B" and "C" models have been delivered to the Army. The Chinook's ability to transport troops, equipment and supplies has resulted in a major advancement in the mobility of the Army.

Mobility has long been a major factor in the determination of success on the battlefield. Hannibal had his elephants, Genghis Khan his mounted Cossacks and Stonewall Jackson his lightning-fast infantry. For centuries no major advancement in the means of mobility was developed. Field commanders achieved their victories by unique application of the means available —foot soldiers, cavalry and chariots.

During the American Civil War the infant railroad was used to great advantage by both sides for the strategic movement of large bodies of troops. The first major breakthrough in tactical mobility came about during World War I with the advent of the truck, the tank and the air vehicles—airplanes and balloons. It was during World War II that the means of mobility made rapid advances and we first began to see the marriage of ground combat units with an air vehicle and we could visualize the advantages of airborne operations.

The Army Tactical Mobility Requirements Board (Howze Board) in the early 1960s developed today's airmobility systems. In a series of tests resulting from the Howze Board's studies, the 11th Air Assault Division (T) proved that the CH-47 could successfully be used as a "flying truck," moving men, equipment and supplies in Vietnam.

As the U. S. ground forces had by now become heavily involved in the Southeast Asian conflict, this was the final test prior to deployment of the 1st Cavalry Division (Airmobile) to the battle arena—the last chance to answer the "unknowns" that would determine the success or failure of the airmobile concept of operations. Could the highly sophisticated Chinooks rise to the challenge of operating in a primitive environment while logistically supporting front line troops with ammunition, fuel, food through a whole spectrum of combat situations, defense troop movements and artillery insertions, and do so with any degree of reliability? Army personnel participating in Air Assault II indicated the CH-47 Chinook fulfilled its missions effectively and efficiently throughout the exercise.

The operation clearly showed that an air line of communications

Some of the 228th ASHB CH-47s at Mayport, FL, (August 1965) awaiting loading onto the *USS Boxer*—destination Vietnam

(ALOC) using a mixture of fixed wing Caribou aircraft and CH-47A Chinook helicopters as primary carriers could maintain and sustain supply of an air assault division completely by air up to a distance of 150 to 200 miles.

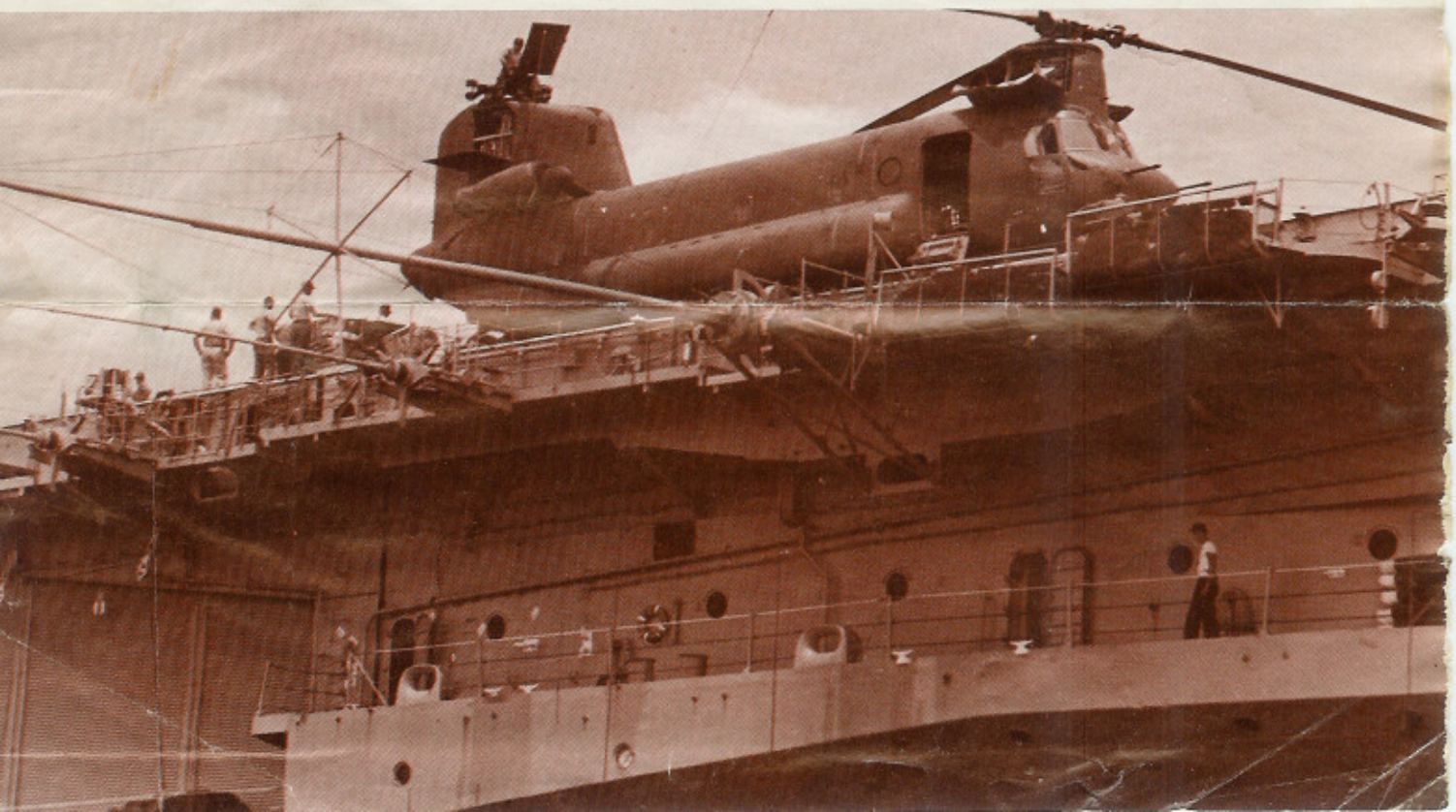
It was also established that the speed with which an airmobile division can accomplish its mission indicates that it will consume 50 percent fewer supplies than an infantry division on a like mission by doing the job in substantially less time.

Another unknown, the ability to maintain large numbers of complex aircraft under field conditions, was answered with results that exceeded expectations. The Chinooks were exposed to field conditions for the first time on a large scale and were available 59 percent of the time, which exceeded the Department of the Army standard of 50 percent availability established for the CH-47A at that time.

During the operation 59 Chinooks flew a total of 5,195 hours.

The initial deployment of the Chinook to Vietnam began in July 1965 when all the aircraft of the 228th Assault Support Helicopter Battalion (ASHB), 1st Cavalry Division (Airmobile), including 57 CH-47A helicopters left Ft. Benning, GA, for Mayport, FL, where they were preserved, bagged (covered with special waterproof covers) and loaded aboard the carrier *USS Boxer*. At the end of the 25-day trip from Florida to Vietnam the aircraft were checked, blades reinstalled and the Chinooks were flown from the deck of the carrier (anchored off Qui Nhon) transporting their equipment with them to An Khe to support the division's operations. One company of CH-47As flew 445 hours during the period 11 through 30 September 1965 transporting 4,826 passengers and 362

Maintenance crews prepare one of the Chinooks aboard the *USS Boxer* in the South China Sea for flight to Vietnam



tons of cargo in the divisional move to An Khe.

Through the period of the most intense 1st Cav operations in the Central Highlands, the 228th ASHB in 4,905 flight hours flew 10,972 sorties, transported 43,609 passengers and lifted 12,365 tons of cargo. Those quantities of cargo and personnel that were lifted in support of operations in the theater are additional testimony not only to the value of the Chinook but equally to the airmobile concept.

The Chinook was being employed in Vietnam according to the same doctrines developed during Air Assault II; i.e., support of infantry, rapid movement of artillery and logistical resupply. However, the severe operating environment and the requirement to carry a nonproductive payload of survival and combat equipment and armor protection (approximately 1 ton) for crew and vital aircraft components lowered the capability of the CH-47A. The requirement for a military payload capability of 5 to 6 tons appeared to be necessary under these adverse environmental conditions.

The CH-47 product improvement program was initiated in mid-1966 based on a requirement from the U. S. Army in Vietnam for a helicopter with capabilities exceeding those of the CH-47A because of degradation of payload and speed capability due to altitude and typical ambient conditions existing in Southeast Asia.

The Army Materiel Command (AMC), in response to this urgent requirement, formulated and launched a two-step airframe improvement program plus supporting engine and ancillary programs to provide substantial improvements in payload, speed and endurance of the Chinook. In addition to the performance improvements, modifications were incorporated to improve flying qualities, to allow full utilization of the expanded flight/performance envelope, to improve reliability, reduce maintenance and to increase aircraft availability.

The CH-47B was the first new version of the combat-tested Chinook. Except for slightly larger rotor blades it was identical in size and similar in appearance to the CH-47A. The flight performance of the CH-47B, however, was appreciably superior. This was achieved primarily through the use of more powerful twin Lycoming gas turbine engines (T55-L7C) and new rotor blades of advanced design which provided significant increases in both speed and payload. Other improvements included better stability and flying qualities through the use of a blunt tail and fuselage strakes plus provisions for additional fuel capacity. The first CH-47B was delivered in May 1967 at which point it became the production model Chinook.

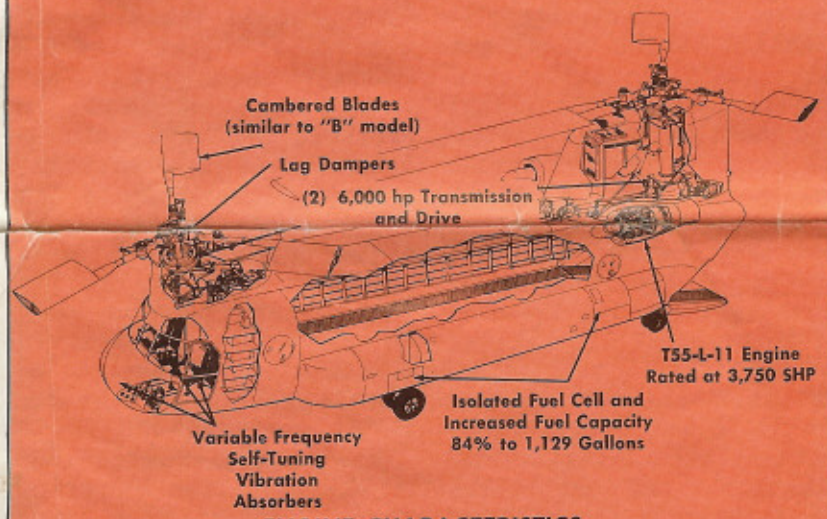
Of course, the ultimate Chinook to evolve from the product improvement program was the CH-47C which provided the capability, under all deployment conditions, for airmobility to achieve its full effectiveness. While being identical in size to both the A and B models and similar in appearance, the CH-47C is powered by new Lycoming T55-L11 twin gas turbines with a drive system currently qualified for 6050 shaft horsepower at 245 rotor rpm. The fuel capacity has been increased to 1,129 U. S. gallons for the extended range/endurance required by some tactical missions.

A review of availability statistics since deployment of the Chinook in 1965 shows a marked improvement with the introduction of the B and C model aircraft. During the period September 1965 through September 1970 availability of the CH-47A model fleet progressed from 53.7 to 77.9 percent with a cumulative availability of 66.8 percent. By comparison, the CH-47B introduced into the theater in February 1968 has demonstrated a cumulative availability of 72.8 percent. Finally, the CH-47C deployed in October 1968 has a cumulative availability of 75.5 percent. Average utilization during this same timeframe has been 59.9 flight hours/aircraft-month for the CH-47A; 60.7 for the CH-47B; and 62.4 for the CH-47C.

From its initial introduction into the Southeast Asian conflict the Chinook has continued to exceed the U. S. Army's standard for availability. On the basis of this ability of the CH-47 to maintain a high rate of availability, the Army has continued to adjust its readi-

This pathfinder stands ramrod straight, relentlessly against the scattering debris and wind as he directs the giant Chinook helicopter in for landing during participation in the Lam Son operation, Vietnam

## CH-47C Chinook Improvements




### ENGINE CHARACTERISTICS

| | CH-47A T55-L-7B | CH-47B T55-L-7C | CH-47C T55-L-11 |
|---|---|---|---|
| Maximum rating (shaft horsepower) | — | 2,850 | 3,750 |
| Military rating (shaft horsepower) | 2,650 | 2,650 | 3,400 |
| Normal rating (shaft horsepower) | 2,200 | 2,400 | 3,000 |

### WEIGHTS AND PERFORMANCE

| WEIGHTS: | | CH-47A | CH-47B | CH-47C |
|---|---|---|---|---|
| Design gross weight | (pounds) | 28,550 | 33,000 | 33,000 |
| | (kilograms) | 12,950 | 14,969 | 14,969 |
| Alternate gross weight | (pounds) | 33,000 | 40,000 | 46,000 |
| (1) | (kilograms) | 14,969 | 18,144 | 20,865 |
| Empty weight | (pounds) | 17,932 | 19,375 | 20,378 |
| | (kilograms) | 8,134 | 8,790 | 9,243 |
| Payload capability | (alternate gross weight) | | | |
| • 10 nautical miles | (pounds) | 13,800 | 19,300 | 24,100 |
| 18.5 kilometers | (kilograms) | 6,250 | 8,754 | 10,931 |
| • 100 nautical miles | (pounds) | 10,300 | — | 19,800 |
| 185 kilometers | (kilograms) | 4,760 | — | 8,981 |
| • Full fuel | (pounds/nautical miles) | 10,313/115 | 15,900/95 | 17,300/149 |
| | (kilograms/kilometers) | 4,672/213 | 7,208/176 | 7,847/276 |
| PERFORMANCE (33,000 pounds gross weight, standard atmosphere): | | | | |
| Hover ceiling—out-of- | (feet) | 7,300 | 10,500 | 14,700 |
| ground effect | (meters) | 2,220 | 3,200 | 4,481 |
| Maximum power | | | | |
| Forward rate of climb | (feet/minutes) | 1,590 | 2,010 | 2,880 |
| (Sea level/normal | | | | |
| rated power) | (meters/seconds) | 8.1 | 10.2 | 14.63 |
| Service ceiling—two | | | | (2) |
| engines | (feet) | 9,200 | 14,000 | 15,000 |
| (Normal rated power) | (meters) | 2,802 | 4,267 | 4,572 |
| Speed capability | (knots) | 110 | 155 | 165 |
| (Sea level/normal | | | | |
| rated power) | (kilometers/hours) | 204 | 287 | 306 |

(1) Excludes troop seats, supports and engine inlet screens
(2) Envelope established by current flight test program

ness standard upward from 50 percent to the present high of 65 percent.

The Chinook fleet has recovered the remarkable total of over 10,000 aircraft in Vietnam that have a replacement value of 2.7 billion dollars. One assault support helicopter company equipped with "B" model Chinooks established a record by recovering 73 aircraft in 1 month. The increased payload of the CH-47C broadens the scope of recovery operations by minimizing preparation time at the recovery site. A recovery of a Chinook by a CH-47C (April 1970) illustrates the point. The downed aircraft was extracted intact with only the blades removed. The estimated weight of the recovered aircraft was 18,000 pounds.

The Chinook has aptly demonstrated the capability of performing an extremely wide range of missions while operating in Vietnam. As was stated by one officer, "The only limitations on the missions a CH-47 can perform in support of a combat operation are strictly dependent upon one's imagination."

In 1966 a new innovation was introduced to Army aviation, namely a CH-47A armed Chinook or as it was fondly called "Guns A-Go-Go." Four CH-47As were modified to flying gunships by the addition to armor and heavy ordnance; i.e., a flexible grenade launcher under the nose, two 20 mm cannon firing forward, five pintle-mounted machine guns (two on each side of the aircraft and one mounted aft) and two rocket pods also firing forward. The great advantage the armed Chinook had was the multiplicity and flexibility of the weapons system and approximately 2½ tons mixed ordnance to ensure maximum loiter time in target area.

This formal test and evaluation, the first actually conducted of an

A Chinook damaged in Vietnam engagement is recovered by another CH-47 and carried 40 miles to a maintenance depot

Army aircraft during combat operations, was controlled by the Army Concept Team in Vietnam (ACTIV). The missions were usually flown by two armed Chinooks for mutual support and included armed suppression, counterambush, close-in fire support against point targets, roadblock destruction, aerial coverage and others. During the 223 missions flown by the "Go-Go's" in 402 flight hours an availability of 61 percent was maintained.

The tests were very successful. However, due to entrance of the AH-1G HueyCobra in the theater, follow-up production of the armed Chinook was not initiated.

Combat support missions are by far the most important and indeed the most hazardous missions the Army aviator must perform in Vietnam.

One Chinook from the 228th Assault Support Helicopter Battalion forced by weather to fly through an artillery fire area was actually hit by a 105 mm howitzer round which went completely through the fuselage without detonating or striking the crew or vital aircraft structure.

In spite of operating continually in combat conditions, the Chinooks have maintained an availability of 69.1 percent over a 5 year period. One aviator made the comment, "I never knew there were so many areas in the Chinook that could be hit without seriously damaging the

Center right: A Chinook brings in sling-load of artillery shells during Operation "Bolling" in Phu Yen area September 1967. Right: This Chinook performed pinnacle hover in Vietnam with room for only aft wheels...note offloading during hover

aircraft or some vital spot within the aircraft."

The Chinook has consistently been maintained at the operating unit level in the primitive areas of Southeast Asia with the Army mechanic's standard tool kit and a basic minimum of special tools. The integral auxiliary power unit furnishes the power for systems check out and engine starting: sight gauges have replaced dip sticks; permanent or oil-lube bearings have eliminated the daily grease gun routine; and integral flush steps and work platforms provide all necessary component access. The built-in provisions for a light air transportable crane have permitted major component changes in remote combat areas, putting the Chinook back in service in minimum time.

This inherent maintainability, so vital in Southeast Asia, indicates that the Chinook can successfully perform routine service anywhere in the world.

Today's military commander has at his disposal the most advanced means of mobility ever enjoyed in any battlefield in the history of warfare.

As a result of its spectacular record in Vietnam, the Chinook is winning favor in many other areas of the world. Although primarily designed and intended for tactical uses, it will continue to be utilized in other roles which are humanitarian in nature and value. Already the familiar beat of its rotors are being heard in South Korea, Alaska, Thailand and Europe. Soon the Chinook will be a commonplace sight to many of the inhabitants of remote areas of Italy, Iran and Australia as it flies its peaceful missions of disaster relief and assistance.

In 1971 the CH-47 A, B and C have exceeded 1,000,000 flight hours, most of the time accomplished in the skies of the Republic of Vietnam.

The CH-47 in one of its peacetime roles — fills water tank (above) for forest firefighting mission (below)