

## Army Ponders Chinook Replacement As Upgrades Continue

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The CH-47 Chinook, the helicopter that has in one version or another transported troops and cargo on battlefields for almost 50 years, may not end its production run until the end of the decade. And the F-models, which are produced at Boeing's Philadelphia factory, may be in service until 2040, or beyond. Yet the Army believes the time is now to begin looking at its future replacement.

"I used to kid all my Air Force buddies that we were going to keep the Chinook in service longer than the B-52," said Brig. Gen. William T. Crosby, program executive officer for Army aviation. "We're flying 70-year-old technology airframes and sustaining them effectively. That's a credit to the soldiers. But are we going to continue to sustain that for another 20 to 30 to 40 years? Or are we going to look for some new technology?" he asked at the Association of the United States Army aviation conference.

While the Chinook first entered service in 1962, the twin-engine, twin-rotor design has its roots in World War II when the Navy was developing a tandem-rotor anti-submarine helicopter.

The airframe of the current models looks about the same as the first iterations of the aircraft introduced 49 years ago. Like the Air Force's long-range bomber the B-52, which has been flying since 1955, there have been several models with significant upgrades, though. Improvements continue to be planned for the Chinook even though it is still in the middle of its production run. Boeing has produced 115 F-models as of February, which is about halfway through its current contract, Pat Donnelly, Boeing's CH-47 domestic program manager, told National Defense.

A change in the way the airframe is put together may make them much more durable than the preceding models. The machined aluminum structure, which involves creating the fuselage out of a block of the metal, means there are roughly half the number of pieces and parts of previous models. This will result in less fatigue on the airframe, he said.

"It should be getting us a longer life," Donnelly said.

All the evidence is anecdotal so far, but reports from the field suggest that there is considerably less cracking and wear on the new airframes, he said. One unit has flown its F-models for more than 10,000 total hours, and has not reported any problems, he added.

"It's clearly more efficient from our perspective to assemble," Donnelly said. "But it's pretty much a wash as far as manufacturing costs." As for the Army, it will certainly gain savings in terms of life-cycle costs because the aircraft will last longer, he added.

One of the other improvements is the digital automatic flight control (DAFC) system, which mimics many of the capabilities of a fly-by-wire system. Fly by wire helps pilots operate an aircraft through electrical

impulses sent by a computer rather than hydraulic, mechanical systems that are directly controlled by its operator.

The F-model still features a hydraulic control system, but the DAFC box can perform many of the tasks through the digital Rockwell Collins common avionics architecture system cockpit.

"It is not fly by wire, but it has a significant amount of capability that reduces the pilot's workload," Donnelly said. For example, in brownout conditions, where pilots have a difficult time landing a Chinook in heavy dust, the push of a button automates the landing process by letting the aircraft descend one foot at a time until it gently touches ground.

The DAFC system has about 80 percent of the capability of a fly-by-wire system, but at about 20 percent of the cost, Boeing officials claim.

Fly by wire takes the burden off pilots, and swapping out a hydraulic system with wires reduces an aircraft's weight, but it is costly to install, Army aviation officials said at the AUSA conference. The service is still studying whether it is worth the extra cost.

Boeing is also under contract to develop new rotor blades that will give the Chinook additional lift capability without degrading forward performance.

"That's always a challenge," Donnelly said. "Typically, if you add more lift, you add more twist, but if you add more twist, it typically gives you more drag. It's always kind of hard to go faster and lift more at the same time."

The company is wrapping up wind tunnel tests for new blade configuration. The goal is to add about 2,000 pounds of lift capability, he said.

Boeing officials interview the members of every unit returning from overseas deployments to garner feedback on how the aircraft is performing. Overwhelmingly, they want an improved cargo handling system. To move pallets on and off the aircraft, technicians must install a kit, which soldiers are not entirely happy with, he said. Boeing is spending its own research-and-development funds to come up with a cargo loading system that would be inherent in the aircraft, and is hoping that the Army will pay for the added feature in the second half of the current production run.

Self-diagnostics that can monitor the health of aircraft components, and a counter-infrared missile system that is built into the aircraft during production instead of being added afterwards are two other features Boeing would like to add to the Chinook.

The Chinook, by all measures, has been a wildly successful aircraft for Boeing, which in 1960 acquired the Vertol Aircraft company founded by legendary helicopter designer Frank Piasecki. More than 800 remain in service worldwide, according to a December 2010 World Military and Civil Aircraft Briefing on the Chinook produced by the Teal Group, an aerospace and defense consultancy. Eighteen nations purchased the earlier C- and D-models. Australia, Canada, the Netherlands, Turkey and United Arab Emirates have ordered F-models. The Teal Group report notes that India, Singapore, South Korea,

Greece and Malaysia have also expressed interest. A major purchase by the United Kingdom is on hold because of budget concerns in the Ministry of Defence, Donnelly said.

The U.S. Special Operations Command also converts Chinooks to a G-model, which is designed to fit its mission requirements. Nonmilitary variants produced in the late 1970s are still being used in Oregon by the logging industry.

Boeing also has contracts to export airframes to Japan and Italy, where local manufacturers integrate their own systems into the aircraft.

The Philadelphia plant where they are manufactured is undergoing a major refurbishing in order to double the number of Chinooks produced from three to six per month, Donnelly said.

The need for increased capacity is not being driven by the Army, Donnelly noted, but rather foreign military sales.

Boeing is incorporating lean manufacturing practices learned from its V-22 Osprey and commercial aircraft operations to gain the increased efficiencies, he said. The factory will also be "green." It will employ ambient lighting and better environmental controls to save energy, he added.

But what does the Army want next?

"In the discussions we've had, they want more of everything. They want more lift. They want to go faster. They'd like to have more internal capacity," Donnelly said.

"If you want to go faster, you start limiting yourself on how fast you can drag what you hang underneath the aircraft in the air," he noted.

This is still all in the "fantasy stage," he said. "They really haven't laid out what they want yet. But as technologies mature, let's put them on the aircraft and keep them going longer than the B-52."

Brig. Gen. Anthony G. Crutchfield, commanding general of the Army Aviation Center of Excellence, said at the conference that the time to begin planning for new helicopters is now. The service should aim for new airframes for all its classes of rotary-wing aircraft by 2030, he said.

Richard Aboulafia, vice president of analysis at the Teal Group, said in the briefing that the CH-47 is "essential."

After the F-model ends its production run, it will remain in service for decades. He estimated 2035, or beyond. Army aviation officials at the conference said 2040.

No matter what the Army needs to do in the future, from peacekeeping, counterinsurgency, disaster relief or regular warfare, the CH-47 is vital to all these missions, Aboulafia said. The office of the secretary of defense would like to fold all its requirements into a joint heavy lift aircraft shared by the Army and Marine Corps, but that won't happen for another 20 years, he predicted. Even that projection could slip further, he noted.

"The future depends on the Army's needs, but there's a great chance of another CH-47X upgrade," he said, referring to model that may follow the F.

"All armies need something to move a platoon, and while the [Marine Corps'] CH-53K represents some competition, Boeing will capture almost all of the market," Aboulafia predicted.