

# Outgoing U.S. Bomber Chief Sees Big Payoff In B-52 Engine Replacement

*Aviation Week*

*James Drew*

The outgoing chief of the U.S. "Mighty Eighth" Air Force has thrown his support behind a reengining of the Pratt & Whitney TF33 turbofan-powered Boeing B-52 heavy bomber, among other modernizations—just as the first nuclear-capable H-model ever to be regenerated from the "boneyard" salvage heap joins the Fifth Bomb Wing at Minot AFB, North Dakota.

Not only could new engines keep the bomber flying past its centennial, commander Maj. Gen. Richard Clark says, but the greater range, altitude, payload and power generation performance afforded by a new or significantly upgraded powerplant would enable new operating concepts that take full advantage of next-generation ordnance, such as hypersonic missiles and high-power microwave weapons.

The first resurrected B-52H Stratofortress, dubbed "Ghost Rider," reentered operational inventory in late September following a 19-month regeneration and depot overhaul process. The aircraft had spent many years in storage at the 309th Aerospace Maintenance and Regeneration Group's facility at Davis-Monthan AFB, Tucson, Arizona.

On Sept. 27, the 55-year-old aircraft flew from the maintenance shop at Tinker AFB in Oklahoma, where it had been since December 2015 after undergoing regeneration in Tucson, to join the fleet at Minot. It will probably serve in conventional bombing and strategic deterrent roles, armed with up to 20 AGM-86-series Air-Launched Cruise Missiles, for two or three more decades.

Current estimates have the venerable 1961-62-vintage bomber flying out to 2040 or 2050 and perhaps beyond, depending on how quickly the next-generation Northrop Grumman B-21 Raider is developed, assembled and fielded. Work on the new bomber officially got underway in February at Northrop's design shop in Melbourne, Florida, and assembly site in Palmdale, California. It should be noted that the Air Force had wanted to retire the B-52H based on the delivery of 132 Northrop B-2s, but the final number was cut to 21. Air Force Global Strike Command chief Gen. Robin Rand said Sept. 19 he wants a minimum of 100 Raiders and about 175 bombers total. But it should not be assumed that the B-21 will replace any single bomber fleet one-for-one, including the B-2 or Boeing B-1B—and the mix and total may change as the Raider comes online in the mid-2020s to free up pilots, maintainers and support crews.

"I have X-number of people to maintain those and X-number to fly those. The capacity to bring a new system on is not going to be there," Rand said. "But maybe [we say] 'keep all four bomber fleets' for a while, if they are going to retire other things and divert those maintainers

and aircrews our way. I'm not saying 'never say never,' but we have not made that decision yet."



***An Air Force Flight-Test Center B-52H prepares to launch the Boeing X-51 WaveRider hypersonic test vehicle. Credit: U.S. Air Force***

The B-52's longevity is a testament to its 1950s-era engineering, but as the old warbird battles on, Clark, who has led the bomber force since April 2015, wants to see significant and continued investment in Stratofortress modernization.

Exactly how long the B-52 is destined to keep flying and stay on the budget books alters the cost versus benefit calculus for any system improvements, but Clark says avionics, radar and powerplant upgrades are needed for the aircraft to remain operationally relevant through 2050 and take full advantage of the next generation of weapons currently being developed or matured.

The nearest improvement, the Combat Network Communications Technology (CONNECT) program, delivers software and hardware changes needed for netcentric warfare, to include a new tactical data link and communications suite. So far, 15 aircraft have been fitted with CONNECT, and the entire fleet should be operational with the upgrade by 2020, Clark says. The next major effort digitizes the internal rotary launcher, converting it from a strategic cruise missile-slinger to a "conventional" launcher capable of carrying smart munitions as well. First

would be the GPS-aided Inertial Navigation System and laser-guided Boeing Joint Direct Attack Munitions, followed by the extended-range Lockheed Martin AGM-158 Joint Air-to-Surface Standoff Missile and Raytheon ADM-160 Miniature Air Launched Decoy-Jammer.

Going forward, Clark says the Air Force is committed to replacing the aircraft's antiquated APQ-166 strategic radar (installed in the 1960s and improved in the 1980s) with a more sophisticated and reliable array.

That acquisition program is moving ahead, he says, leaving one major component of the B-52 left to modernize—its eight engines. Options range from a one-for-one TF33 replacement, to scaling down from eight to four engines, or swapping out components to drive up performance. The same engine powers the Boeing E-3 AWACS and Northrop E-8 Joint Stars, as well as the KC-135 Stratotanker before it was reengined with the CFM-56.



***A B-52H Stratofortress, nicknamed "Ghost Rider," conducts a functional test flight on Aug. 30, 2016, at Tinker AFB, Oklahoma. Credit: U.S. Air Force***

The TF33-P-3/103 is one of Pratt's earliest turbofan designs and is many decades overdue for replacement. On top of being many times cheaper to maintain, Clark says an engine replacement would allow the bomber to fly farther, higher and with a greater payload while generating more power for onboard electrical systems.

"The engine is the one modification that right now we are wrestling with, because it is very expensive, but it's critical that we get that done," he says. "If we are going to keep the B-52 around for some time, having new engines on it, in my opinion, is crucial. The current engines

we have are very old and are expensive to operate. If we're going to have this aircraft around for a long time, we need to invest now to reap the benefits of the new engine."

The Air Force has been considering replacement options since the 1980s, back when it would have been superseded by 132 B-2s. From the end of the Cold War until recently, bombers have been a lower priority than fighters on the budgetary food chain. Today, Air Force Global Strike Command has the unenviable task of convincing Air Force leadership and Congress to spend money reengining a 55-year-old dinosaur, just as billions of dollars are being sought for the B-21.

"As far as upgrades go, the engines are the one area that I think could provide a good return on investment if we could find a way to fund it," Clark says. "We are looking hard at our options now, but it is a very tough budgetary environment we are in, so we're [looking at] creative ways to do this."

Clark expects the B-52 will continue to play an outsized role in the employment of new weapon systems, such as high-speed cruise missiles that travel above Mach 5 and others that use bursts of high-power microwave energy to nonkinetically knock out enemy electronics. Air Combat Command, which trains and equips the conventional combat force, and Global Strike, which maintains nuclear-capable bombers and intercontinental ballistic missiles, are pursuing a range of next-generation weapon systems. Among these are new close air support weapons, a family of bunker-busters to destroy fortified and deeply buried targets, and a next-generation, AGM-86 replacement, the Long-Range Standoff cruise missile, which will be used for conventional and nuclear strikes. Much remains under development at the Air Force Research Laboratory (AFRL), which is pursuing directional high-power microwave technology for carriage on repurposed cruise missiles and potentially on unmanned aerial vehicles (UAV). Its latest project is titled High-Power Joint Electromagnetic Non-Kinetic Strike, or HIJENKS.

Other efforts, such as DARPA's Gremlins and AFRL's Low-Cost Attributable Strike are maturing recoverable air-launched UAVs for surveillance, decoy, electronic attack or strike operations in highly defended regions. The B-52 has been used to test most new U.S. air-launched weapons since its introduction in the 1950s, and is integrated with the widest array of weapons of any aircraft in the inventory. Notably, a B-52 launched the scramjet-powered Boeing X-51 hypersonic test vehicle during four tests, and most likely fired the AGM-86C-based Counter-electronics High- Power Microwave Advanced Missile Project, or CHAMP, missile during a single test at the Utah Test and Training Range in 2012.

"We do want to have a bomber forces that is flexible enough to deploy the new weapons that will come down the line in the next 10-20 years," Clark says. "[The B-52] is well-suited to take on a number of different weapons systems, and so putting new engines on it and keeping it a viable platform, especially from a standoff perspective, gives us a huge amount of flexibility. Having new engines, modifying the radar, and really that internal weapons bay modification, that puts the B-52 in a position to take on new weapons and to be a viable standoff platform. The B-52 has been for some time, and will continue to be, the backbone of

that fleet. So as those new weapons come online, we will always have an eye on the B-52 as a potential platform to launch them from."