New Power for an Old Soldier—Re-engining the B-52 Stratofortress

By: Tony R. Landis

There is an old joke that runs through the bomber fleet that when the B-1 and B-2 bombers are retired, the pilots will be flown home from the boneyard in the B-52 Stratofortress. With the recent proposals to re-engine the Boeing B-52 fleet, that may have some truth to it. This legendary aircraft has outlived nearly all of the aircraft designed to replace it. This brief history will take a look back at many of the efforts proposed to keep the B-52 fleet upgraded with new engines since its inception.

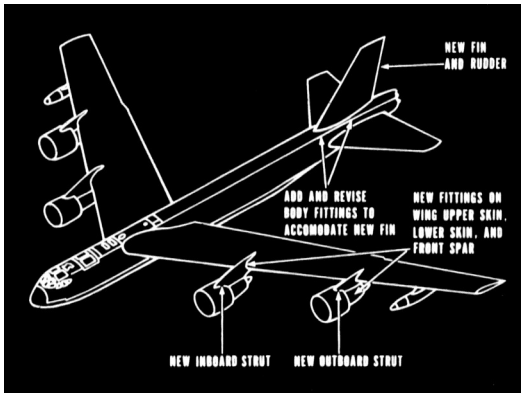
The Boeing prototype XB-52 was utilized for a series of tests utilizing an afterburner-equipped J75 engine on the outboard wing pylons. (Boeing)

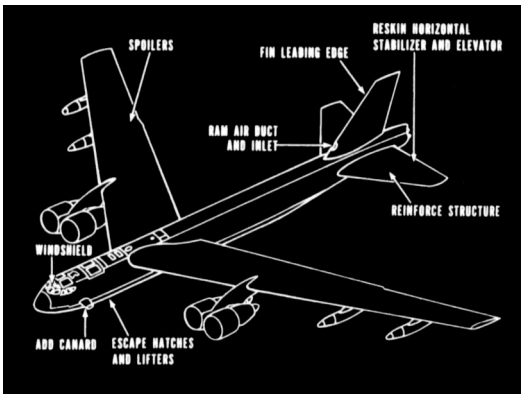
The first production B-52A first flew on August 5, 1954, with the first in-service B-52B's following a short time later. Despite being powered by eight Pratt & Whitney J57 engines, the bomber felt underpowered from the start. Even with water-injection added for additional thrust at take-off, the aircraft suffered from marginal performance with a full weapons load on a hot day.

In early 1956, Major General Al Boyd, Deputy Commander for Systems, Air Research & Development Command (ARDC), requested the feasibility of replacing the pair of J57's with a single afterburning J75 engine on each of the outboard pylons to achieve better performance. The prototype XB-52 was made available and the aircraft made a series of flights in this configuration between November 1957 and August 1958, logging over 140 flight hours. Despite the final report stating a 'substantial performance improvement', the configuration was not adopted for the fleet.

When the last B-52 was delivered to the Air Force on October 26, 1962, this final H-model variant was now utilizing the Pratt & Whitney TF33 turbofan engines which gave much better performance than the original J57s.

Another attempt to find new engines came in 1969 when Boeing began a study to re-engine the B-52 fleet and again in August 1971 when the Air Force and Boeing performed a more detailed study on replacing the engines with High Bypass Ratio Turbofan engines on all B-52G & H models. Boeing studied a concept using a single turbofan on each of the four wing pylons and another that used two engines on a single inboard pylon. During 1975, with the highly-contested Rockwell B-1 program in full swing, members of Congress offered a re-engined and upgraded 'B-52I' as a replacement. Again, it was not adopted.





Boeing studies from the early 1970's were the most detailed to date. They proposed the use of single engines on each pylon as well as dual engines on the inboard pylon with additional fuel/equipment pods on the outboard stations. (USAF)

HISTORY IN TWO

The 1980's saw Pratt & Whitney making a detailed study into replacing the eight TF33s with four PW2000 (F117) engines. Since it was expected that the B-52 would be replaced by the B-1 and B-2 by the mid-1990's, this idea never gained traction. The issue was studied again in January 1996 after an incident with B-52H #60 -0054 when a double engine failure caused engines number 3 & 4 to depart the aircraft in flight. In this case, Boeing and Rolls-Royce teamed up and proposed the use of the Rolls-Royce RB211-535 similar to those used on the commercial 757 aircraft. The Air Force once again rejected the proposal.

Numerous engines have been proposed for the B-52 over the years such as the Pratt & Whitney J75, Rolls-Royce RB211-535 and the CFM International CFM56 with different designations having been applied to the re-engined aircraft including B-52I, B-52R & B-52RE. (Photo/Illustration by Erik Simonsen)

By 2003, the cost of overhauling the old TF33 engines had tripled and another USAF/Boeing study on re-engining the fleet determined it would cost approximately $4.5 billion to complete, but would yield a cost savings of nearly $15 billion over the life of the bomber in addition to increasing the combat range by 22% and reducing greenhouse gas emissions. The engine competition between the Pratt & Whitney PW2000, Roll-Royce RB211-535 and CFM International CFM56 (F108) could be partially financed under the Energy Savings Performance Act which allows the Federal Government to partner with private industry on energy conservation methods. Despite the amount of effort put into this proposal, nothing was to become the engineering effort.

Once the Air Force decided that the B-52 would be in service until at least 2040, by which time the service plans to have retired all B-1B and B-2 bombers, a new proposal in 2018 was undertaken to re-engine the 76 plane fleet to fly alongside the next-generation Northrop B-21 Raider. This latest effort is known as the Commercial Engine Replacement Program (CERP) with the idea of outfitting the legendary aircraft with commercial off-the-shelf, in-production business jet engines. The goal is 20 to 30 percent better fuel efficiency with a 40 percent increase in range, ease of maintenance utilizing the latest onboard diagnostic equipment and lower greenhouse gas emissions. Pratt & Whitney, Rolls-Royce and General Electric are expected to compete for the multi-year contract to purchase over 600 replacement engines with Boeing serving at the systems integrator.

One day a new aircraft will be designed to replace this legendary machine and this latest effort may be the best hope to keep this iconic aircraft flying for at least another quarter century proving that old soldiers never die, they simply fade away.

Two of the latest contenders for the B-52 engine program are the Rolls-Royce F130 (top) and the General Electric Passport (above). Both will fit the current nacelle configuration with minimal modifications.

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