Swept-Wing Wonder, Part III

In Flight Usa

Scott Schwartz

Retired B-47 on display at the March Field Air Museum. Notice how the aircraft seems poised to fly. The aircraft was designed with a built in eight-degree angle of attack, because the elevators could not produce enough force to rotate the aircraft for take off. (Scott Schwartz).

Outfitting the Model 450 with tricycle landing gear would have necessitated the placement of bulges in the wings. This, of course, would have disrupted the smooth aerodynamics of the thin wings. Ironically, it was another demand placed on the design by the Air Force that led to a solution to the landing-gear problem.

The Air Force wanted the new bomber to be able to carry an atomic bomb. Since atomic bombs were very large, during the 1940s, aircraft carrying them needed very large bomb bays. A bomb bay large enough to accommodate the atom bomb would not leave much room for landing gear to be mounted in the fuselage. Well, luckily, the Air Force also came up with a solution to its problem – namely a "bicycle" landing gear arrangement. In other words there would be two main landing gear trucks mounted in the fuselage, fore and aft. As always seems to be the case in aircraft design, each solution creates another problem in its wake. In this case, it was the fact that the landing gear would have to be installed in front of and behind the bomb bay because the bomb bay had to be placed where – when loaded – it would be in harmony with the aircraft's center of gravity. With the rear landing gear placed so far aft, it could not serve as the pivot-point for rotation on take-off; the elevator simply would not be able to raise the nose.

A close-up of the B-47's "bicycle" landing gear. Placing the landing gear in the the B-47's thin wings would have required drag-producing bulges. (Scott Schwartz)

The answer that was hit upon by the Boeing design team was this: attach the landing gear in such a way that the airplane would sit on its landing gear at the proper angle for take-off. An aerodynamicist by the name of Bill Cook figured that an eight-degree angle between the wing chord line and the ground would provide the optimum angle for lift-off from the runway. The reader might imagine the aircraft tipping to one side or the other during taxi, due to the "bicycle" main wheel arrangement. Small outrigger wheels, which retracted into the inner engine pods, were installed, in order to prevent this.

Interestingly, the priorities of the Army Air Forces shifted towards the long-range, strategic deterrent philosophy, as the development of the Model 450 progressed. Boeing responded to this shift by lengthening each of the Model 450's wings by eight feet. These wing extensions reduced drag, which, of course, reduced fuel consumption.

Duly impressed by the Boeing design teams' handing of the various challenges that had surfaced during the development of the aircraft, the Army decided to demonstrate its faith in the project by ordering two XB-47 prototypes in 1946. Construction of the two aircraft commenced in June of that year; the Boeing and military personnel involved were extremely excited about working on such an advanced project.

As it turned out, though, the people involved with the XB-47 project were virtually the only ones excited about it. Many others at Boeing believed that the XB-47 was merely an experimental aircraft – and an impractical one at that – which would never enter full-scale production. Therefore, interest in the project was lackluster. There was also the fact that the company was already gearing up for production of the B-50 (a B-29 derivative), and it was pinning its future hopes on yet another B-29 descendant – the B-54. What made the B-54

intriguing was the fact that it was to make use of “Variable Discharge Turbine” engines to propel it. The Variable Discharge Turbine (“VDT”) essentially involved routing the hot exhaust gases from the B-54’s piston engines (Pratt & Whitney R-4360s) through a compressor, mixing them with additional air, igniting them, and then obtaining jet-thrust as the mixture passed through a turbine and exited through a large exhaust nozzle. A pattern emerges here; namely, the reluctance to completely veer away from piston engine bombers.

From a business standpoint, one cannot entirely blame Boeing for hesitating to embrace jet engine technology – at least not entirely (the “VDT” engine could be described as half of a jet engine). Although companies like General Electric were making vast improvements, the early jet engines had a service life of only 10 to 20 hours, or so. Moreover, jet engines used much more fuel, in general, than piston engines. So, the idea of using jet engines to power a long-range bomber was viewed as sheer folly, by many.

Nonetheless, the jet-bomber visionaries in the Army (and later the United States Air Force) and at Boeing carried on. In September of 1947, the first XB-47 was rolled out of the Boeing factory. Less than one hundred people gathered for the event.