



WARBIRDS

By Frederick A. Johnsen



P-40 Tomahawk AK295 on an early morning flight over New Zealand in 2011.

Photo by Gavin Conroy via Lewis Energy Group

Restoring vintage aircraft to like-new condition takes time, money, expertise—and lots of TLC.

THE scarcity of some World War II airframes today drives a small industry that can take what can only be described as airplane DNA and deliver a restored, flying aircraft. Restoration technology now makes it feasible to resurrect historic aircraft from little more than dented scraps of metal.

A striking example of this artistry is one Curtiss P-40C Tomahawk that survived a crash landing in 1942 to emerge as an award-winning restoration indistinguishable from the day it rolled off the Curtiss assembly line in 1941. The restoration shunned the iconic, but now ubiquitous, “Flying Tiger” shark’s mouth paint scheme to create instead a rugged-looking US Army Air Corps fighter of the type that rose to meet Japanese warplanes over Pearl Harbor on Dec. 7, 1941.

The Tomahawk’s odyssey began when it was earmarked for the British Royal Air Force and then transferred to the Soviet Union in December 1941. Identified with the RAF number AK295, it was technically a Tomahawk IIB—essentially equivalent to the USAAC’s P-40C.

Russians Ran Them Hot

Some Soviet veteran aviators of World War II expressed high regard for the Tomahawk, revealing how they boosted its performance by stripping excess equipment and running hotter throttle settings to make their early P-40s more aggressive against German fighters. If ignoring US flight manual procedures trashed engines, it may also have contributed to the longevity of airframes by making the Curtiss fighters serious adversaries.

But longevity was not in the cards for AK295. In February 1942, it crash-landed in Siberia—where it remained reasonably intact for decades.

How and when this aircraft was found, recovered, and brought back to life is subject to considerable debate, however, and the true story was lost as AK295 changed hands repeatedly over the past 20 years.

It may have been first spotted by satellite imagery. It may have been recovered from the ground in 1990, 1993, 1994, 1996—or another year. It may have been damaged by exploding ordnance during the initial recover, but probably wasn’t. In fact, AK295’s history from the early 1990s to the mid-2000s is extraordinarily muddled, with each



A formation of P-40s train near Moore Field in Texas in 1943.

“If a bomb went off under it, there’d be nothing left of it,” Wilson opined. He also wonders how a bomb could stay beneath the airplane during a crash landing without separating.

Regardless, Wilson’s Tomahawk was the worse for wear. “It was pretty bad, but it was definitely a rebuild,” Wilson said.

As often happens with downed aircraft, this wreck was hacked into, over the years, with parts removed for other uses. As a result, the skins were “junk,” Wilson said. He rebuilt the fuselage, using as much of the underlying frames and stringers as he could keep, with new aluminum skin binding the airframe together—just as when it first emerged from Curtiss’ factory. Much of the original wing structure was usable; Wilson estimates the finished project is about 70 percent original.

“It’s no different than rebuilding a Category 3 or 4 airplane during the war,” Wilson modestly said, referring to wartime aircraft damage assessment categories.

The project was shipped in 2004 to an Ardmore, New Zealand, restoration shop, Avspecs, for completion. The task—undertaken by Wilson and then Avspecs—was daunting but not impossible.

The Tomahawk and its early model P-40 brethren used a fuselage cross-section a bit stouter than later P-40s, because the Tomahawk evolved from the radial-engine P-36, a prewar fighter with greater girth to match that of its power plant. And Tomahawk blueprints weren’t available in many cases. Some prototype XP-40 drawings offered clues to the curved engine cowlings,

new source seemingly contradicting previous bits of information.

And yet, this is not unusual in the warbird restoration business. This is a fast-moving, free-wheeling industry in which aircraft frequently change hands, few long-term records are kept, and aircraft are quickly out of sight and out of mind—leaving participants to mentally reconstruct events from many years before.

What is known for certain is that by the early 1990s, AK295 and another Soviet Tomahawk were earmarked for recovery.

The respected British warbird organization, The Fighter Collection of Duxford, commissioned a Russian salvage operation to recover the Tomahawk.

“We understand that one [P-40C] was thought to have a drop tank attached under the aircraft during its recovery by helicopter,” a spokesperson for The Fighter Collection said. Unfortunately it turned out to be a bomb that exploded during the hoist, severely damaging the P-40 and causing the crash of the helicopter. This P-40’s exploded wreckage was abandoned and subse-

quently recovered by others, the TFC spokesperson said.

Tomahawk AK295 was said to be the bomb-damaged fighter, but Tom Wilson, a P-40 restorer who received the airframe at his Griffin, Ga., shop and rebuilt its fuselage in the 1990s, is skeptical of the live-ordnance story.



A bright red gasoline cap and a bright yellow oil cap—both tanks accessed through the P-40C’s aft cockpit glazing—were faithfully restored on AK295.



P-40s (these painted with the iconic “Flying Tiger” shark mouths) at a base in China in 1943.

Wilson said, but they were different in important ways from the P-40C.

This is why the custom warbird reconstruction scene is such a remarkable organism. Wilson initially studied the aircraft sheet metal trade under the mentorship of a metal master who still had the tools he used when he helped create the original XP-40 in 1938. Wilson’s knowledge of the P-40 was bolstered by his experience with the former Curtiss craftsman. “I was a P-40 nut since I was a kid,” Wilson admitted. Even as a nine-year-old watching television reruns of the 1942 John Wayne movie “Flying Tigers,” Wilson said he could spot the fake Hollywood mock-up P-40s.

Tools of the Trade

With restorers using one part common sense and one part reverse engineering, the recovered P-40C blossomed. Some pieces, such as engine cowling panels with compound curves, were best fabricated the old way, on an English wheel, a metal forming tool that can make a sports car fender or a warbird panel—if the operator has sufficient artistry to do the task by hand.

Other pieces were fabricated using machine tools unheard of seven



AK295 on the ramp at EAA AirVenture 2012, an air show in Oshkosh, Wis. The restoration is not only cosmetic—even parts not seen by the public are restored.

decades ago. Computer Numerical Control, or CNC, machining makes it possible to replicate some three-dimensional metal parts without the expense of specialized tooling; short production runs for warbird restorations can provide fittings, brackets, and even whole wing spars that would have brought restorations to a grinding halt a few years ago. This process is not cheap, but is accessible.

And that’s where a sea change is occurring among warbird owners and operators. Gone are the days when restoration consisted largely of replacing missing pieces with surplus parts and leaving basket-case airframes out behind the hangar as useless junk.

Today, unrestored airframes are rare, and that commands a much higher ante to get in the game. Warbird restorations can easily top a million dollars for a



AK295 in flight over New Zealand just after the meticulous refurbishment was completed in 2011.

finished product. And the process is not for the faint of heart—or wallet. It is impossible to precisely calculate the cost of a project as unique as a vintage warbird reconstruction. The cost will vary depending on hours of labor and the difficulty of finding or fabricating parts.

If wealthy philanthropists of an earlier era funded libraries and art museums for the public good, there's a cadre of warbird enthusiasts who are using their considerable fortunes to do the same with scarce warplanes. Some are on show in publicly accessible museums.

Others, like the Tomahawk AK295, now in the Texas collection of Rod Lewis, are flown to air shows in various parts of the country each year—helping spectators capture the exponential value of seeing and hearing a real warbird from the past.

True to its factory design, this P-40C includes quirky and sometimes inconvenient features in the name of authenticity, like the circular holes in the aft cockpit Plexiglas to access fuel and oil filler caps. Such attention to detail earned this restoration the 2012 Reserve Grand Champion Award for World War II aircraft at the prestigious Experimental Aircraft Association's AirVenture event in Oshkosh, Wis.

Oshkosh has become the premier conclave of warbirds each summer, showcasing hundreds of privately owned ex-military aircraft ranging from pristine salon pieces to gritty working machines. The judges at Oshkosh also appropriately conferred a Phoenix Award on Lewis' Tomahawk, in recognition of its rebirth from a half-century of repose in Siberia.

Photo by Frederick A. Johnsen



P-40C AK295 (foreground) in its olive and gray paint scheme lines up with two more-commonly seen P-40Es, painted as Flying Tigers, at the Oshkosh air show.

With early model warbird resurrections such as this P-40C, there can be regression in flying characteristics. Later P-40s used a newer Allison engine design that shortened the length to the propeller. Warbird pilot Steve Hinton, who has years of experience flying these rare assets, said he found the P-40C a bit less stable than later P-40s because of the longer distance to the prop and shorter distance to the tail on the C model. Curtiss redesigned the fuselage, and ultimately the late-model P-40N had a noticeable stretch to the tail.

Hinton received AK295 when it returned to the US in 2011 after final restoration and test flights in New Zealand. Hinton's company, Fighter Rebuilders, reassembled the C model at Chino, Calif., and Hinton completed its first flight since the rare bird returned from New Zealand.



USAF photo

Nets partially camouflage a P-40 under repair at Kunming, China, in 1941.



Jose Flores, based in the mountain town of Tehachapi, Calif., was central to the rebuilding of the early Allison C series engine in the P-40. Flores is the shop foreman and vice president of an engine rebuilding firm called Vintage V-12s. The co-owner is Mike Nixon.

Nixon's name has become synonymous with warbird engine rebuilding and maintenance, another rarified warbird industry. The warbird community relies on old engines properly rebuilt and serviced to keep its treasures airworthy and safe.

After World War II, a surfeit of Allison engines sold for as little as \$200. Today, according to Flores, a freshly rebuilt Allison can cost \$200,000. The scarce long-nose variant in the P-40C resulted from the combination of two of the early power plants, plus additional parts, to make one good engine. Flores figures the early Allisons have about 50-50 commonality with the later more readily available versions, so with the touch of Vintage V-12s' craftsmen, the early engine—an amalgamation of about 7,000 individual parts—came to life again in time to power Lewis' fighter.

The process was "a little tricky," Flores said. "You have to know your parts. It's a fun engine. It's unique." The timing sequence for this Allison is opposite from that on later models, and it took Flores a bit of sleuthing to figure it out. The propeller and crankshaft rotate in the same direction on early Allisons. Later models used a different gearing that had the crankshaft and the propeller shaft turning in opposite directions.

The P-40C's restoration is more than skin deep—Flores and his team at



Flug Werk produced some 20 full-size "kits" of the World War II Focke-Wulf Fw 190. This one was repainted in the colors of German ace Erich Rudorffer for the Finnish film "Tali-Ihantala 1944."

Vintage V-12s installed the engine's gun synchronizer mechanisms that keep the nose-mounted machine guns from running afoul of passing propeller blades, even though it no longer needs these fire interruptors and they are not seen by the public.

Few people pack around so much knowledge about World War II liquid-cooled engines as Flores. It's all part of the recipe for thorough warbird reconstruction.

Prolonging Engine Life

The ability of Flores and the others at Vintage V-12s to keep rebuilding engines relies on access to parts. Tons of engines and spares were produced to feed the voracious logistical needs of the Army Air Forces seven decades ago. The Vintage V-12s team is always on the lookout for parts they can acquire and store for future rebuilds. Flores said the prospect of manufacturing new V-12s is not economically feasible, so it is up to the finite supply of existing engines.

With long-nose Allison engines so scarce, Flores is still optimistic. Museum-quality P-40s get anywhere from 10 to 25 flight hours per year, he said. That compares to as many as 100 flight hours for some of the more prevalent P-51 Mustangs on the warbird circuit.

When an engine leaves overhaul at Vintage V-12s, the battle is upkeep versus wear-and-tear. A freshly rebuilt Allison out of Tehachapi may clock 500 to 600 hours before it needs its first overhaul. Thereafter, Flores said, "the wear is starting to increase quickly."

He advises operators to change the oil after only 25 hours of flying, regardless of how clean the lubricant appears. When an overhaul of a customer's engine comes due, it can start at \$75,000.

The price, availability, and desirability of the current iteration of masterful restorations affects their sale and migration in the warbird community. Mark Clark, whose Courtesy Aircraft

Sales company is known for its sales lists of million-dollar warbirds, said rare ones such as the early P-40C tend to appeal to a collector of several aircraft; the one-warbird owner-pilot is likelier to want one of the favored icons: a P-51D Mustang or even a later P-40E variant. With a limited number of high-quality, award-winning warbird restoration shops extant, prices can sometimes be affected by availability. "The good shops are booked with a long lead time, and buyers are willing to pay more to get something sooner," Clark explained.

The wizardry of specialized warbird restoration and fabrication shops has reached a level of sophistication permitting the construction of completely replicated versions of classic fighters.

The German company Flug Werk produced about 20 full-size kits of the fearsome World War II Focke-Wulf Fw 190 fighter, using an available Soviet-designed radial engine to stand in for the German power plant.

Flug Werk's new-build 190s use original Fw 190 tail wheel assemblies. An interesting concession is the use of modern jetliner nose wheels for the main gear. A Flug Werk spokesperson described them as "affordable, readily available, and the only tire which will safely withstand the stress and strains of operating this aircraft from hard-covered runways." This is important, since wartime films often show that German fighters took off from vast grass campuses instead of paved runways.

The Flug Werk team made a few alterations, notably to correct an oil cooling issue found on some early original Fw 190s during the war, and changed some bracketry to accommo-

date modern and available systems in the airframe. But they pronounce their Fw 190 airframes as 98 percent similar to the originals.

Flug Werk is also moving into the Mustang business, marketing an aircraft kit they call the AP-51 Palomino to distinguish it from an authentic P-51 Mustang. They tout the ability of modern computerized CNC milling to create crucial fittings from a billet of forged metal instead of using casting methods. The CNC machining is said to give a repeatable measuring tolerance of 1/100th of an inch, without any warping sometimes found in the cooling of castings.

Today, warbirds are even replacing old metal with new. Some aircraft items, such as perishable rubber tires, hoses, fabric control surfaces, and plastic cockpit glazing, have long been considered consumables that need periodic replacement. Now, whole airframes can be substituted. This has led to choices in restoration methodology, as some warbirds emerge from the shop with anything damaged being replaced outright. Others use parts that have evidence of aluminum skin patches, executed as they would have been during World War II, to preserve as much of the original structure as safely possible.

Warbird restorers and exhibitors, mindful of the impact their iconic aircraft have on the public, have increasingly gone to detailed, almost arcane, lengths to make their aircraft period correct. Hardware has been stamped with the same kind of inspectors' marks used during wartime production. Minute instructional stenciling is being replicated, even on hidden access panels. The personalized artwork adorning some restorations has been hand-painted with colors and brushes that would have been available during the war, giving a slightly scruffy cachet of authenticity to the result.

The uptick in restoration perfection coincides with the unfortunate accelerating loss of World War II veterans. A greater burden is now being placed on the aircraft of that era to be the witnesses to history, outliving the people who flew these machines so many years ago. ■

Frederick A. Johnsen retired as director of the Air Force Flight Test Museum at Edwards AFB, Calif., to pursue museum, writing, and video projects. He is completing a major study of the interface between the U.S. Air Force and German aerospace technology from the 1930s into the postwar era. His most recent article for Air Force Magazine, "Flight Test Transformation," appeared in the October 2012 issue.