Excerpt from “The P-51 Mustang: A Case Study in Defense Acquisition”

by Alan Haggerty and Roy Wood

North American’s goal was to build the fastest aircraft they could make given the limits of the Allison [V-12] engine. [This engine had a simple, one-stage supercharger rated for low-altitude flight, since American doctrine at the time called for fighters to operate in direct support of ground troops at low level.] Their designers decided to use two cutting-edge technologies that had never been included in a production fighter aircraft before.

The first was the laminar-flow wing. The laminar-flow airfoil was the product of massive investments in the 1920s and 1930s by the U.S. government, specifically the National Advisory Committee on Aeronautics (NACA), the forerunner of the National Aeronautics and Space Administration. This design “smoothed” the otherwise turbulent airflow across the wing surfaces, reduced drag, and increased aircraft speed and efficiency (“Laminer Flow Airfoil,” 2010).

The second was an untried cooling radiator design called the Meredith effect duct. The Meredith duct was essentially a divergent convergent duct with a radiator at its widest part. The theory was that the engine’s waste heat would accelerate the flow of air through the duct, producing a ramjet effect to reduce engine cooling drag at high speeds. The design had never been used before, and, in fact, had only been proposed as a theoretical possibility in an academic paper in Britain between the World Wars (Meredith, 1936)…

But, of course, the story didn’t end there. The American tactic of low-altitude fighter combat proved to be flawed—aerial dogfights were high-altitude affairs in the European theater. The Allison engine was not up to the task because its supercharger lost power at high altitude. The British, however, had developed the Rolls Royce Merlin, with a superlative high-altitude supercharger. This innovative two-speed, two-stage supercharger had been designed by a young Cambridge University mathematician, Stanley Hooker, and it allowed the Merlin to operate at high power to altitudes above 40,000 feet (Hooker, 1984).

The new P-51 Mustang, with the improved Merlin engine and larger fuel tanks, went on to dominate the air war over Europe, and later the Pacific. The German Air Force commander said after the war that he knew the war was lost when he looked up and saw Mustangs in the skies over Berlin (Rickard, 2007). In the opinion of many historians, the P-51 turned the tide of the war in Western Europe and was crucial in gaining the final victory there.

Article Retrieved from http://www.dau.mil/pubscats/PubsCats/ARJournal/arj56/ARJ56_Final.pdf

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