The Mustang Story: Recollections of the XP-51
By John P. Reeder NACA/NASA Test Pilot

Beginning in 1940, Langley helped North American Aviation test its prototype of the P-51 Mustang, the first aircraft to employ the NACA laminar-flow airfoil in the wing design. The aircraft was used in all theaters of operation during World War II. About 15,000 of the series were constructed. During the war the plane represented the highest level of technical refinement ever achieved in a propeller-driven fighter aircraft. Built as the fourth North American XP-51 Mustang, this plane arrived at Langley for NACA trials in December 1941.

Last summer during Oshkosh ’82, EAA President Paul Poberezny piloted XP-51, Serial Number 41-38, on its last flight. Subsequently, the sleek little fighter has been put on display in the EAA Foundation’s new Aviation Center as the centerpiece of the Warbird section.

Developed in 1940 by North American for the British, the handmade prototype of the Mustang was so successful that the design was quickly committed to production... with the fourth production machine going to Wright Field for evaluation by the U.S. Army Air Corps. This aircraft, Ser. No. 41-38, was later turned over to NACA and spent most of World War II serving as a test bed for a number of aeronautical experiments. After the war, it became a part of the National Air and Space Museum’s collection, and in 1975 was traded to the EAA Foundation for a Northrop Alpha. That August, the XP-51 was trucked to Ft. Collins, CO where it spent the next year undergoing a complete restoration by Darrell Skurich. The Allison engine was overhauled by John Sandberg’s METMA in Minneapolis.

Darrell flew the resurrected fighter, now resplendent in a new Charles Day paint job, to Oshkosh ’76 for its debut into the world of sport aviation. It was maintained in flying condition... although rarely flown other than during the annual EAA Conventions... until its retirement last summer.

As the earliest existing P-51 and the very first to be delivered to the U.S. government, the airplane is a very significant artifact. It is the nearest thing we have today to the progenitor of the entire legendary Mustang line... and as you will read in the following article, was the airplane that opened the Air Corps’ eyes to the design’s potential.

As mentioned, Ser. No. 41-38’s operational days were spent in a research and developmental role. One of the pilots who flew it was “Jack” Reeder, who recently retired from a long and distinguished career with NACA/NASA. Several years ago, he promised that one day he would write up his recollections of the XP-51... which he has now done.
WAR WAS UNDERWAY in Europe and the British and French were in desperate need of more fighter aircraft, particularly for reconnaissance and support of ground forces. When a British Air Purchasing Commission arrived in the U.S. in April 1940 to arrange for procurement of additional aircraft, it considered only two U.S. fighter aircraft eligible, although not ideal. These were the Curtiss P-40 and the Bell P-39. These would require some modifications to accommodate some of the lessons of the war up to that time (before the Battle of Britain). After the British had contracted for P-40’s and P-39’s within the constraints of the companies’ production capacity, they asked the North American Aviation Co. (NAA) in Los Angeles to consider production of P-40’s also. Discussions indicated that about 120 days would be required to tool up and set up the production lines at NAA. NAA officials suggested to the British that, within 120 days, a completely new and better airplane could be designed and built specifically to British requirements and would be better adapted to mass production. British requirements included higher speed and rate of climb, improved maneuverability up to higher speeds, and increased range and firepower compared with current fighters. The British approved a preliminary design by NAA on May 4, 1940, and were impressed enough to order 320 of this NAA design, NA-73, on May 29, 1940. The airframe was complete on September 9, 1940, having required 2600 drawings and 60,000 man hours, but the priority for the only engine available at that time, the Allison V-1710-39 of 1150 hp, had not been high enough within that company’s limited production capacity to avoid a delay. As a result, the first flight, highly successful, was not made until October 26, 1940. Although some aerodynamic corrective changes were required, the aircraft proved to be a masterpiece of advanced, integrated aerodynamic design, an example of intelligent application of government research and industry information available. It was also a handsome airplane. It was the first airplane to use the laminar flow airfoil concept of the National Advisory Committee for Aeronautics (NACA) in the wing design. However, laminar flow with its low skin friction drag was not realized because the required wing surface smoothness could not be obtained on the production line nor preserved in service. However, the shape of the laminar flow airfoil reduced peak airflow velocities over the wing, thus postponing and minimizing “compressibility” effects on the airplane (drag rise, lift loss, nose down “tuck”, buffeting and loss of elevator effectiveness for dive recovery) which plagued other contemporary fighters above a Mach number of about 0.7. The new airfoil thus gave the P-51’s an advantage in high speed combat encounters.

The overall handling characteristics of the XP-51’s (Mustang I’s) were nearly ideal, particularly when compared with other fighters of the period. Later P-51s models, as a result of the effects of increased power (larger crosswind forces on the propeller due to angle of attack and sideslip and more intense slipstream rotation effects at the tail) and configuration changes, suffered some deterioration in stability and control characteristics. This resulted in corrective modifications, such as added tail surface area (and tail length in the case of the P-51H), and bob weights to increase elevator force feel in maneuvers.

The official top speed in level flight of the early production model (Mustang I, or U.S. Army Air Corps XP-51) was 382 mph at 13,700 feet altitude, the critical altitude of this low altitude engine. As an example of how advanced this aircraft was, consider the case of a long established U.S. fighter designer and builder who also had access to the same research and development information as NAA did. Starting on an advanced fighter in the same year the Mustang I was conceived, this company delivered its new fighter, powered by the same Allison engine as the XP-51, to the AAC in 1942, the year following the XP-51. It was smaller and lighter than the XP-51, but achieved only 355 mph top speed, 27 mph slower than the Mustang I. As a matter of fact, the Mustang I was about 30 mph faster than nearly all contemporary fighters, including the Spitfire. This company’s next version of an advanced fighter, using the same high altitude Merlin engine as the P-51B, was delivered in 1943 and was 50 mph slower than the P-51B. The P-51 came into its own when it was re-powered with Rolls Royce Merlin high altitude engines, the V-1650-3 and V-1650-7. These engines were by this time being built by Packard in the U.S. The P-51B, entering combat operations in 1943, and the P-51D, which entered combat operations in 1944, maintained a speed margin over all other allied fighters in production until mid-1944. The last production model of this aircraft, the P-51H, was too late to see service in Europe but limited numbers served in the Pacific as escorts for B-29 bomber operations against Japan. It was the fastest propeller-driven fighter in the war, at 487 mph.

Most significantly, the superior range of the P-51’s was due to their aerodynamically efficient design and large internal fuel capacity, augmented with large external drop tanks, which allowed up to 7½ hour missions. This allowed protective escort of the heavy bombers to the heart of Germany for the first time, which was an important key to victory in Europe. As a fighter, the P-51’s destroyed 4,950 enemy aircraft in combat and 4,131 on the ground in the European theater alone. It was very successful in the Mediterranean and Pacific theaters as well, having performed all the roles of a fighter in outstanding fashion.

**By John P. Reeder (EAA 105751)**

**NACA/NASA (Ret.)**

**247 James River Drive**

**Newport News, Virginia 23601**

The Story of XP-51 #41-38

When the U.S. Government, in 1940, gave the British Air Purchasing Commission permission to deal directly with NAA in creation of a new fighter aircraft, it directed that two copies of the first production lot of the new aircraft be provided the U.S. Army Air Corps (USAAF) for evaluation at no cost, a routine procedure for aircraft designed and built in the U.S. for foreign governments. Consequently, the numbers 4 (USAAF number 41-038, 1038, or 41-38) and 10 (number 41-39) NA-73 (Mustang I) production aircraft were delivered to the AAC at Wright Field, Ohio, in August and December 1941, respectively. They were, at this time, designated XP-51’s. They were delivered in their natural aluminum finish with the blue bar and red and white stripes on the rudder (see Figure 1), and the red, white and blue star insignia on top and bottom of the wings.

Little enthusiasm was shown for the XP-41 #41-38 at Wright Field when delivered. In September a new pneumatic gun charger, of interest to both the U.S. and the British, was installed in the XP-51, since it was not otherwise scheduled, and evaluated at Eglin Field in Florida. The world soon came back that the XP-51 was the best fighter