The fifth production P-51H, 44-64164. Pilot believed to be George "Wheatles" Welch (NAA 126-0 courtesy of G.H. Balzer)

The North American Aviation P-51H Mustang

Part I

by David R. McLaren

The H model Mustang was the *P-51 version which totally evolved as the end result of knowledge gained through combat experience and the observed shortcomings of its predecessors. The continuing pressures of WW II constantly demanded technological improvements on our existing designs to combat the continuing threat of improving axis aircraft. The potential, and later, introduction of jet warfare in Europe, and the extended over-water missions in the Pacific left the Army Air Force little choice but to demand improvements on what we already were using until we too could enter the jet era. As it was, the ultimate Mustang produced, the P-51H, was the only production version to never see combat or fly in the service of a foreign air force.*

THE PREDECESSORS: XP-51F, G, AND J

With cooperation from British engineers, and at the request of the Royal Air Force, North American Aviation engineers began, in 1943, efforts directed toward improving the Mustang. NAA's noted Mustang designer Ed Schmued traveled to England where he inspected the Supermarine factories and analyzed reports on both allied and captured enemy aircraft. He keyed his efforts toward retaining all of the proven P-51 qualities to the maximum extent. The outcome was the XP-51F, which was a *new* airplane design, strictly to British specifications. It only resembled previous Mustangs in general outline.

These resultant changes esentially came from reduced criteria; a 4g landing gear for the RAF versus the 7g capability the AAF would eventually require from the P-51H. The RAF also demanded an improved rate of climb and improved maneuverability. Tests comparing operational Mustangs against other types of fighters then in use showed that the Mustangs were 1,200 fpm slower than the Spitfire at maximum rate of climb to 20,000 feet, and the FW-190 had twice the rate of aileron roll. The RAF wanted a positive 6g flight stress minimum versus 7.33 that was presently required by the AAF. They were willing to settle for a lower limited airspeed however, 475 mph, but the P-51H went a bit better than expected and ultimately was limited at 505 mph IAS.

The three experimental "lightweights" came under the factory "Charge Number" of NA-105, which bore an assignment date of Jan. 2, 1943, when the program for the RAF was commenced. The first effort was the XP-51F (the designation P-51E

was never used), and was followed by the P-51G and J, which were essentially Fs with engine and propeller modifications. The F used a Packard-built Rolls-Royce V-1650-3 (the same engine used in the P-51B/C), but it was fitted with a three-bladed Aeroproducts Unimatic propeller which spanned 11 feet. This propeller was used because of reduced airframe weight, to maintain a proper center of gravity.

Bob Chilton, one of North American's most famous test pilots, reported that he made a total of 69 flights in the first F, 43-43332, between Feb. 14, 1944, and April 12, 1945. Despite pounds of Simonize and many attempts, the best he could get it to do with 2,000 hp and 90" hg was 493 mph. This still was more than the RAF wanted, but not as much as the engineering team desired. Chilton flew the third P-51F, 43-43334, RAF serial FR409, five times before it was sent to Boscombe Downs, England, for evaluation on June 30, 1944. The second F, 43-43333, was flown by Chilton seven times between May 22 and June 30, 1944. This last flight was to the Vultee factory at Downey, Calif. Neither Bob, nor anyone else, apparently, can remember the final disposition of these P-51Fs. According to Bob, the P-51F was the most fun to fly of the whole series because of its lightness, controllability, and power-to-weight ratio.

The P-51G was produced with two different propellers, either of which was driven by a Rolls-Royce RM-14SM engine. This powerplant was similar to the Merlin V-1650-9 that was used on the P-51H. Both the number one and two aircraft, 43-43335/43336, used Aeroproducts Unimatic A-542-B1 propellers for evaluation. This is contrary to most reports, with one exception. The Rotol wooden propeller which was fitted on the first P-51G resulted in what many consider to be the prettiest Mustang, but it was a failure. It was flown on one 20-minute flight. Chilton stated that "At cruise speed I found the airplane to be completely directionally unstable and unfit for further testing." Chilton had flown the first flight on the number one P-51G on Aug. 14, 1944, and flew it for a total of nine tests. Joe Barton, another crack NAA test pilot, flew the remainder of the test flights on this aircraft in this country. (There remains the possibility that the first flight of the P-51G may have been made on Aug. 9, but that no meaningful data was obtained because the engine could not develop sufficient power above 21,000 feet. If this is true, Chilton acknowledges, this test flight would have been flown by Barton.)

The second P-51G, which became FR410, was first flown by Barton. FR410 was shipped to England and commenced test flights for the RAF on Nov. 14, 1944. These tests continued until Feb. 1945. The final disposition of these lightweights that were shipped to England is unknown, although the RAF did ask the AAF to "please dispose of them for us."

The last NA-105 model was the P-51J, which marked a one-time return to an Allison engine for the P-51 design. The V-1710-119, with water injection and a two-stage supercharger, utilized a four-bladed Aeroproducts A-542 propeller. The P-51J was largely a failure as a result of engine problems. Chilton stated that he never flew it, in fact, "probably avoided it. . . . The Allison engine had an infinitely variable speed supercharger, hydraulically activated by automatic dipstick control commanded by manifold pressure as dictated by throttle position. Ever hear of Rube Goldberg?" Eventually all of these combinations were worked into something viable, as the engine was

The XP-51G, 43-43335, with a five-bladed prop, was pretty, but the propeller created unworkable difficulties for the plane. (NAA 105A-0-24)

The second XP-51G, 43-43336, in RAF markings. From this angle the rudder appears taller, but was still the P-51D type. (NAA 105A-0-31)

The XP-51J, 44-76027, probably the cleanest looking Mustang with its tightly cowled Allison engine. (NAA 105B-0-33)

The first production P-51H Mustang, 44-64160, on North American's Inglewood ramp. The first flight of this airplane was made on Feb. 3, 1945, by North American's chief Mustang test pilot Bob Chilton. (NAA 126-0-3C courtesy of Dustin Carter)

P-51H, 44-64160, with test pitot installation under left wing. This airplane was delivered to the joint Army Air Force/North American Flight Test Division on Jan. 1, 1945. It never became a squadron assigned aircraft. (NAA 126-0-2C courtesy of Dustin Carter)

The most photographed P-51H, 44-64164, was delivered to Moffett Field, Calif., on June 2, 1945, transferred to NACA temporarily at Langley Field, Virginia, for aerodynamic tests, followed by Air Material Command assignments, and eventual assignment to the California Air National Guard where it served with the 195th and 196th squadrons. (NAA courtesy of G.H. Balzer)

put to use in the P-82E, F, G, and H.

The XP-51Fs and Gs were 32 feet 3 inches long, whereas the J was 9 inches longer at 33 feet. The H became the longest of the lightweights at 33 feet 4 inches. Ed Horkey, Chief Aerodynamicist for North American, stated that this extra length was to "increase longitudinal and directional stability as the increased propeller solidity and engine horsepower made the slipstream effects more destabilizing." In other words, the extra length smoothed out the prop wash along the fuselage.

According to Chilton, "The army was well aware of the design and resultant performance limitations of the F; when it came to a production design they insisted they had to have the higher 'g' loading and dive speed capability." Those modifications to the basic XP-51F airframe produced the P-51H, which was the heaviest of the lightweights, weighing some 1,000 pounds more than the P-51F.

Some of the shortcomings in the XP-51F were obvious. It could not carry a fuselage fuel tank, due, in part, to the hydraulic mechanism which opened and closed the elongated canopy. The gunbays were designed to hold only two .50-caliber machine guns each. The bomb racks, which were jettisonable, were limited to 500 pounds each. Still, the XP-51F may be considered as the prototype for the P-51H, as the design was carried through without really significant modifications and did mark a major departure from previous Mustangs.

Contract AC-1752 was let on April 26, 1944, for production of 2400 P-51H aircraft. The new factory "charge" number became NA-126, which superceded the original designation of NA-117 that bore the "charge" date of Aug. 10, 1943. This dropped NA-117 had been a proposal for 2500 P-51Hs. Under NA-126 the factory serial numbers were allocated from 126-37586 and ran through -38140 when construction terminated. The AAF serial numbers commenced with a block beginning with AF44-64160. Twenty P-51H-1NAs were produced, bearing serial numbers 44-64160 through 179. These were followed by 280 P-51H-5NAs serialing from 180 through 459, and were followed with 255 P-51H-10NAs serialing from 460 through 714. The actual H-10NA block had been intended to run through 44-64989 where additional modifications would have created an H-15NA series. The aborted -15s would have serialed from 44-64990 through 44-65009. It apparently has not been recorded what changes would have been made to create the -15 series, or the -20 series which would have commenced at 44-65010. The -20 series continued serialing through -65159, but serial numbers beyond this point have not been discovered, -65160 beginning a block assigned to P-82Bs.

There were two additional contracts let for lightweight Mustangs which were canceled due to the end of the war. The first was for 780 additional P-51Hs bearing serials 45-31456 through -32236. The second was for a sister ship, the P-51L, NA-129, of which 1700 were to have been built at the Dallas plant. But the L project was canceled before any construction commenced. The P-51L, essentially, was identical to the H with the exception that it would have been powered by a V-1650-11 Merlin without water injection. The P-51L would have carried serial numbers 45-32237 through -33935.

Some of the production information on the P-51H is ambiguous and obscured by time. North American's "Report O" states that aircraft 801 and 802 in their factory serials were "Pilot Ships." These aircraft became 44-64554 and 555 respectively. Although numbered consecutively, they were not made available to the AAF until Aug. 24 and Aug. 31, 1945. While 554 was delivered to Kelly Field, Texas, the next day, 555 was retained at the factory for two months. Today, nobody can remember what the term "Pilot Ship" signifies.

Supposedly the P-51H was a "throwaway" fighter. Depending on where you get your information, it was designed to last somewhere between 90 and 300 combat hours. Since the aircraft was not used in combat these figures are academic. However, of 170 record cards where the flying time was totaled, the average number of hours amassed was 1090.

By V-J Day, 370 P-51Hs had been delivered and the contract was soon terminated. However, all of the remaining subassemblies were allowed to be completed, until an aircraft was "born." Production lasted until Nov. 9, 1945, when the line was stopped. There was no fanfare, no photographs, no mass of people, just a handful remaining from the many who had worked for so long and so diligently to produce the finest piston-powered fighter ever built. It was small satisfaction to know that they had at least kept the line open two months longer than the

P-51H, 44-64161, was retained by North American for several years, eventually becoming a TF-51H. (NAA courtesy of G.H. Balzer)

Mustang's stablemate, the P-47N.

To dispel some rumors before continuing with the story of the P-51H, most sources mention that the P-51M was to have been yet another variation of the H. Not so. The P-51M was basically a P-51D-30NT (Dallas-built). The only similarity to the H was that it was to have also used the V-1650-9 Merlin engine. But this engine was a -9A and did not feature water injection. (These -9A engines served as postwar replacements for the V-1650-7s used in the D). The P-51M engine also used the Hamilton-Standard 24D50 cuffed propeller. The single accepted P-51M-1NT was serialed as 45-11743, which became NX61151 on the civilian registry. Sixty-three additional Ms and one TP-51M were built through Aug. 14, 1945, but these were never accepted by the AAF and presumably were flown from the factory to the scrap yard.

And, the P-82 was not two "cobbled together" H fuselages. The P-82's fuselages were essentially modified and lengthened versions of the NA-105, P-51F. The only P-51H features involved in the early P-82 were the outer wing panels and the V-1650-9 engines. In fact, many of the ideas utilized in the P-51H came from the design effort directed toward the XP-82 program, which had a factory charge date of Jan. 7, 1944.

THE AIRCRAFT: TOTAL COST, $54,476 PER ISSUE

The fuselage was constructed in three sections: empennage, mainbody, and engine mount, all being joined by bolted fittings. The length of the main fuselage, from the firewall to the vertical stabilizer, without the rudder, was 22 feet 2 inches. The total length was 33 feet 3¼ inches. The mainbody was semi-monocoque aluminum alloy which was flush riveted. Two channel section transverse beams make up the upper and lower longerons and act as spar flanges on each side of the fuselage. Maximum width was three feet at the cockpit. No significant structural component was interchangeable with previous production aircraft. In fact, only about 10 percent of the original aircraft features were retained.

The cockpit featured ¼-inch armor plate in front of the windshield, 1½ inches of bullet-resistant glass windshield, 5/16-inch of armor plate behind the pilot's seat and 7/16-inch armored headrest. All of this armor weighed approximately as much as the pilot. The cockpit was heated by a 15,000-btu thermostatically controlled combustion heater (Janatrol) which drew outside air from an intake in the left wing and exhausted through a louvered vent on the starboard side of the engine nacelle. This heater also provided boundary layer defrosting to the windshield. In practice, the heater had to be turned on before commencing a high-speed dive from altitude or it would take approximately 15 minutes to defrost the glass.

To improve instrument and long-range flying conditions for the pilot, an effort was made to group the engine instruments and flight instruments in separate sections on the panel. A newer type seat was also installed, improving the old "bucket"-style seat. It was adjustable to 12 positions to reduce fatigue caused by having to sit in the same posture on long-range missions. On the left side of the seat was a "g" suit attachment for combat maneuvers. The valve opened at two "gs" under normal conditions and at 3 to 3½ "gs" if drop tanks were retained, due to the engine-driven vacuum pump which also pressurized the external tanks. A flare pistol mount was found on models preceding 44-64279.

Behind the pilot's seat was the fuselage fuel tank (some diagrams erroneously show two). This tank contained 50 gallons of usable fuel and was gravity fed. The tank itself was of a new design, and did not cause the center-of-gravity instability problems for the pilots as those tanks found on B/Cs and D/Ks.

Radio equipment was located on a rack accessible through a hatch on the port side of the fuselage. Basic equipment was one VHF command set, an eight-channel AN/ARC-3; one receiver, BC-453-B, for low-frequency radio range navigation; one radio compass, AN/ARN-7. The associated loop, which was unhoused, was either installed behind the pilot's headrest or located behind the right wheel well. An additional piece of navigational equipment found on many Hs was the AN/ARA-8 homing adapter. Aircraft so equipped are identified by having twin masts behind the cockpit. This handy piece of equipment received aural-null tones for navigation and could be used to permit homing on any transmitted carrier. It could be used off of ground stations or airborne aircraft, and served as DF (Direction Finding) in reverse, giving the pilot the information on the direction to fly instead of the ground operator. For operating in a radar environment either a SCR-695-A or an AN/APX-6 IFF was installed (Basic Mark 10 for the older readers, transponder for the younger ones). Tail warning radar of the AN/APS-13 variety was installed as government supplied equipment through

Bob Chilton shared responsibility for testing the P-51H and other "lightweight" Mustangs with NAA test pilot Joe Barton. (NAA)

44-64690 and utilized a warning bell/light combination to warn the pilot someone was on his tail. P-51Hs with this equipment were stripped of it by orders from SAC before being transferred to the Training Command or Air National Guard.

Above the radio rack and behind the pilot's headrest were three low-pressure oxygen cylinders containing 1000 cubic inches (13.3 cubic feet) of gas. These tanks had check valves, so if one or more were combat damaged or leaking the entire system would not be depleted. The system normally operated at 400 psi, duration depending upon flight conditions.

Reams have been written on the prowess of the Rolls-Royce designed Merlin engines; and it is beyond the scope of this endeavor to go into those details which are not peculiar to the P-51H.

The V-1650-9 engine in the H was built under license, from Rolls-Royce, by the Packard Motor Company. It incorporated a two-stage, two-speed automatic shifting supercharger and developed 1380 horsepower at sea level; this is considered as takeoff power, i.e., 61" hg and 3000 rpm. War emergency power was attained by the use of water injection from a 10-gallon reservoir which supplied seven minutes of maximum power at 3000 rpm and 90" hg. This setting gave 2270 brake horsepower at 4000 feet in the low stage of the supercharger. At 19,000 feet the high blower cut in and provided 1860 bhp with the same rpm and manifold setting. This was some 500 hp greater than the -7 engines and gave the H a 26 percent greater rate of climb over the P-51D. When the water supply was depleted three additional minutes of high power were permitted at 67" hg and 3000 rpm without endangering the engine.

Manifold pressure was automatically maintained by the Simmonds pressure regulator between 25" hg and 67" (dry). The speed density injection carburetor also was fully automatic and no provision was made for manually leaning the mixture. This merger of components increased the critical altitude of the engine beyond previous designs. In fact, the pilot's Dash-1 stated emphatically that if "a pilot chooses to ignore the charts, he can fly any mission confident that the airplane is capable of greater performance than he is capable of obtaining from it."

The engine was attached to the fuselage with two semi-cantilever box beams which also served as attachment points for the nacelle. This saved some 40 percent in weight over the mount used in the previous types and also provided for easier maintenance.

The elongated cooling system housing was one of the distinctive traits of this model Mustang. Internally, the refinement of the H over preceding production models is that instead of two separate radiators for engine and oil cooling the unit was constructed as a single fixture with two separate cores. This provision gave a marked weight reduction. For engine cooling, a total capacity of 14.4 gallons of water glycol and corrosion inhibitor was furnished. The after-cooling system capacity was 6.2 gallons and was forced through the radiator by an engine-driven pump to the supercharger cooling jacket and then returned to the radiator. This method cooled the fuel/air mixture before it entered the cylinders and minimized the possibility of detonation or pre-ignition.

The integral oil system was a 16-gallon tank containing 13.75 gallons, the remaining space being utilized for expansion. Total capacity, including oil lines, was 18.5 gallons. Oil collected in the sump was automatically routed through the heat exchanger or through the oil tank, depending upon temperature, after passing through the filter and pressure relief valve.

While sounding somewhat complicated, the new cooling system actually reduced the inherent vulnerability to combat damage by reducing the amount of space required for its components. Limit switches controlled the "flipper door" to prevent overextension on the ground, being actuated by the tail wheel truss on H-1s and three-pole electrical relays on the -5s and -10s. As long as the tail wheel was down, the door would not overextend. When the tail wheel was retracted, the door could open fully to allow for maximum cooling. It was a two-man operation

P-51H, 44-64182, the first H model fitted with the interim broad chord rudder. Even though the fin was a short term design, it was equipped with the tail warning radar antenna. (USAF via NASM)

P-51H, 44-64191, and P-51D, 44-75021, demonstrate the design differences between the two models. 191 was wrecked in a takeoff accident in 1954 after accumulating 2,081 hours. (AAHS lending library 7403 via E.C. Carey)

to "re-cock" the door if it had been hyperextended by the pilot under emergency conditions.

The propeller was an Aeroproducts H20D156-23M5 Unimatic four-bladed selective constant speed airscrew spanning 11 feet 1 inch. Pitch was variable between 23 degrees (fine) and 58 degrees (course), but the prop was not featherable. Engine rpm was automatically determined by adjusting the propeller control in which the pitch also adjusted the governor.

The wing was a low drag NAA/NACA laminar flow full cantilever aluminum alloy stressed skin type which had less cross-sectional thickness than the types used on previous Mustangs. The wing was constructed in two main components which were joined at the fuselage center line by shear bolts. The leading edge was straight tapered, with no forward sweep and was designed to take advantage of the reduced size of the main gear tires. Thus the "cranked" leading edge, as on previous P-51s, was no longer required. The improved wing section also provided for attachment to the fuselage close to the center of gravity, which helped enhance the aircraft's stability.

The original P-51 wing had been designed with a stress capability of 12 gs, but by the time the H came along this had been changed to a pilot-induced limit of 7.33 gs. This was due to increased aircraft weight brought on in part by the fuselage fuel tank. Unmodified P-51B/Cs were stressed to 10.5 gs and limited to 7 gs. P-51Ds were limited to 6.3 gs and had an ultimate pullout factor of 8 gs before there was danger of losing a wing.

The main spar was aluminum alloy and was stamped from a single piece of stock. The ribs were also stamped, but from lighter alloy, and featured lightening holes. The main wing spanned 37 feet 5/16 inches, and encompassed 235 square feet, including ailerons, which totaled 13.41 square feet, the flaps totaling 31.74 square feet. Normal wing loading was 40 pounds per square foot (the P-51D had 43 pounds psf). This approximated the same wing loading as the F8F, which had an additional 10 square feet of wing area. Chord at the wing root was 8 feet 9 inches; near the tip it was 4 feet 2 inches. Incidence was plus one degree and dihedral at the 25 percent line was five degrees. The sweep back of the leading edge was a negligible 3 degrees.

The ailerons, as well as all other control surfaces, were conventionally controlled with dual cables. The leading edge was cusped and featured a fabric diaphragm between it and the rear wing spar. This lightened the control stick forces. Aileron deflection was increased from 12 to 15 degrees over previous models and provided an increased rate of roll. The control surfaces were locked from the cockpit, but felt-padded gust locks could be used in high wind conditions.

Wing flaps were hydraulically controlled. The system operated at 1750 psi, plus or minus 50 pounds if everything was working as advertised. Total downward deflection was 45 degrees. Basically, the flaps could be lowered in 10-degree increments, but full flaps were not permitted above 160 mph indicated air speed. Of course, in actual operation they were used as "combat flaps" and dumped when the pilot wanted to tighten his maneuver. They could only be raised or lowered after the landing gear was through its cycle if the aircraft was in that phase of flight because of the lack of hydraulic pressure. The flap setting was read directly off of the flap by the pilot, their positions being marked by white and black bars.

The wings' internal fuel tanks were self-sealing and gravity fed from left to right and each tank contained an electric submerged booster fuel pump. These booster pumps provided enough fuel pressure to maintain the needs of the engine at all altitudes if the engine-driven pump failed. The left tank contained a total volume of 110 gallons, of which 106 were usable. The right tank volume was 107 gallons, of which 104 gallons were usable. To facilitate repairs the tanks were designed so that they could be taken out through the rear wing spar after removing the flap, but without having to disconnect the aileron cables. The left wing tank and fuselage fuel tank could be removed before flight to lower the aircraft's weight. This was intended to be done if the aircraft was to be used as a short-range interceptor, or if used

North American Aviation test pilot Joe Barton sitting in the cockpit of a P-51F, G, or J. (NAA)

strictly for training. One fuel gauge was installed on the instrument panel with three pointers to indicate quantity.

External tanks were in three sizes: of 75, 110, and 165-gallon capacities. Fuel pressure for the drop tanks was provided by a vacuum pump on the carburetor at five pounds psi. In the event this pump might fail, the engine-driven pump could draw fuel at altitudes below 10,000 feet. Pilots operating with the 165-gallon tanks were cautioned to use only basic flight maneuvers required for normal flight due to the weight of the tanks.

The aircraft's landing gear was of conventional type with the tailwheel freewheeling or steerable at the pilot's discretion. The tailwheel itself was maintained at 70 to 80 pounds of pressure, and was 12 x 4½ inches diameter. Depending upon technical orders or operational requirements, these wheels were often locked in the down position. The reasons will be found later in the aircraft's operational history. All P-51Hs eventually had their tailwheels locked down.

On some ex-SAC aircraft, an indicator light on the instrument panel showed the position of the tailwheel. This was an in-the-field modification brought about by the many problems with the retracting mechanism. An additional light on the instrument panel showed the position of the main gear wheel well doors. This light was installed because it was possible for the pilot to crush the doors if he changed the direction of travel of the landing gear in mid-cycle, i.e., tried to retract the gear in a go-around from a landing attempt before it had fully expanded.

The single strut oleo main gear used an air/oil combination and was inward retracting with a 133½-inch span between tire centers. This gear design was both the aircraft's weak and strong point. The weight saving of 700 pounds over the forging used in the P-51D model also brought a bit of fragileness to how it had to be treated by pilots. The light dural forging did not have the strength of the larger magnesium casting used on previous models. It could not withstand lateral stress without twisting or collapsing, which resulted in expensive rebuilding operations in the airplane's early career, or in being written off entirely toward the end of its service life.

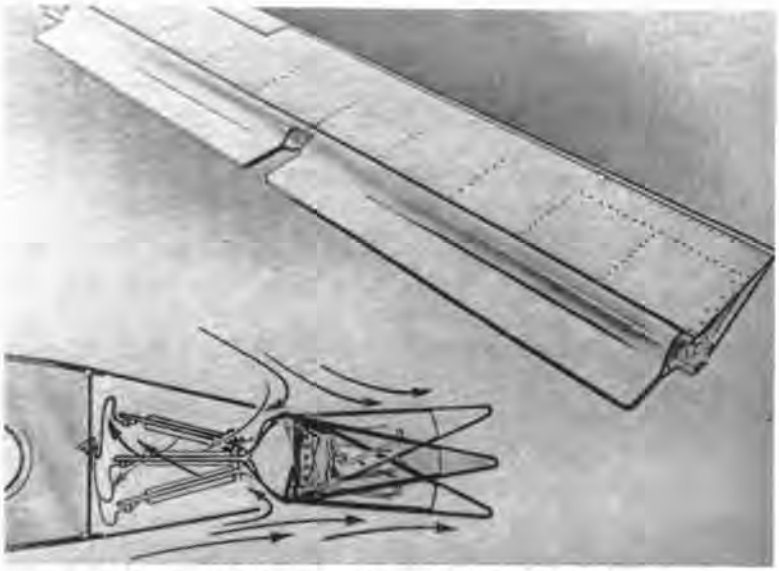
There were no down locks fitted to hold the gear in place while stationary, as the weight of the aircraft would prevent inadvertent retraction. However, it was possible to collapse the gear while taxiing or towing if the gear selector handle was inadvertently moved. A spreader bar had to be used while towing to prevent such accidents. For emergency gear extension a bungee cord allowed the gear to fall in place by manually bypassing the hydraulic system, but the flaps had to be moved to a mid-cycle position to relieve the pressure.

Tires utilized on the main gear wheels were Goodyear all-weather 24 x 7.7 inch, eight-ply high-pressure types which were maintained at 70 to 90 psi, depending on the runway surface. Main wheel brakes were disk type, with three pads on each side of the rotor.

The empennage was one-fifth larger than earlier Mustangs, which enhanced maneuverability. The horizontal stabilizer was of all-metal construction incorporating two main spars and pressed flanged ribs, as in the main wing. The vertical stabilizer progressed through three major design efforts and became one of the salient points in type recognition. The initial vertical fin was basically the same as the type found on later P-51Ds.

The third P-51H-5NA, 44-64182, was fitted with an interim broad chord vertical stabilizer. This design was further "capped" on the thirteenth -5, 44-64192, for additional evaluation, and was found to be the most satisfactory. (It must be noted here that these were not production line changes, but retrofitting at modification centers. According to Chilton, "Nothing stops the line." Hs produced as late as 44-64266 still used the interim fin.) The end result provided a total of 14.6 square feet of surface area, which included the permanently mounted cap. The enlarged area obviously provided for a great deal more stability, but as one pilot stated, "There was still more than enough torque to hurt you." The reference being, of

The P-51H instrument panel was of the latest design, with the idea of lessening pilot fatigue. Engine and flight instruments were grouped as closely together as possible. (Author's collection)



The P-51H's sealed-balanced ailerons enhanced maneuverability by lightening stick forces. (Author's collection)

The P-51H's revised engine cowling enhanced target acquisition and deflection sighting over the nose. The gunsight's range compensating unit was built into the throttle. (Author's collection)

course, to "cobbing the throttle" without use of judicious rudder and trim. Pilots were cautioned to never use more than 60" hg on a go-around because of the lack of available rudder.

The Hs did not generate the reputation of the preceding Mustangs for having overpowering torque, but this is probably due only because of the lesser number in service. It is noteworthy though that North American was experimenting with rudders of increased sizes to overcome the lack of directional stability at low speed and high angles of attack, when sudden power applications would render Mustangs uncontrollable. The first P-51D-5NA built under the "charge number" of NA-109, 44-13253, and the later P-51D-25, 44-84900, were fitted with these larger tail sections. These were not P-51H rudders, however, even though they appeared similar. The attached fin cap added 2.33 square feet of additional area to the D's vertical stabilizer, but the rudder counterbalance remained in alignment with the trim tab. The final version of the P-51H's fin moved the counterbalance up with the increase in height. Those P-51Ds built (or rebuilt) by the Cavalier Corporation for their Counter Insurgency versions, and many of the models they sold on the civilian market that featured the larger rudders, followed the design used on 44-13253.

Total rudder travel on the final P-51H was 25 degrees or 10⅜ inches. The trim tab could be adjusted between 8 degrees right and 14 left via the trim wheel in the cockpit.

As in any armament system, the key to accuracy is in the gunsight. The P-51H used either the K-14A or B, and either version could be used in a fixed or computing mode. The reticle provided six diamond-shaped pips with a bull's-eye, and was calibrated in mills (one mill equaling one inch at 1,000 feet, which equaled 83 feet 4 inches when adjusted to 1.8 mills). The ranging control was on the throttle for pilot convenience while the wingspan of the intended target was adjusted on the base of the sight. The sight could also be set up for either rocket firing or dropping ordnance. One of the advantages of the redesigned engine nacelle was that visibility over the nose was improved to eight degrees below the horizon, which also increased the effectiveness of the sight.

The machine guns were M-2 type Brownings with G-9 solenoids and J-4 heaters. The gunbays were designed so that either two or three guns could be carried, but all were delivered in the six-gun configuration. The guns were installed at a minus two degrees deflection with a normal convergence at 800 yards. Inboard gun trays held 390 rounds regardless of whether the center gun was used. If the center gun was carried, then it and the outboard gun each had 260 rounds available, but if the center gun was left out, the outboard tray could hold up to 460 rounds. An AN-N6 gun camera was installed in the leading edge of the left wing to record hits.

The external bomb racks were electric units which had integral sway braces. The electrical portion was used for arming the bombs in flight, thus the bombs could be jettisoned in a safe condition if required. The rack itself could be utilized to carry bombs ranging from clusters of fragmentation or incendiary through 1,000-pound high-explosive types. Depth charges, mines, chemical or smoke tanks, or external fuel could all be carried as examples of versatility. The removal of the bomb rack facilitated installation of two additional zero-length rocket racks which would then total 10 rockets as underwing ordnance. Rocket sizes ranged up to T-64, the five-inch HVAR, which gave the P-51H the firepower of the proverbial destroyer.

One of the little-known components and capabilities of the P-51H was the installation of photo-reconnaissance cameras. These cameras were installed between the inter-cooler exhaust shutter and the tail wheel well. Two different aerial mapping cameras could be used, the K-17 or K-12, the latter being adaptable to 6, 12, or 24-inch lenses for use at 5, 15, or 30,000 feet. A 12-inch lens was also usable for oblique photography. For low-altitude reconnaissance work, i.e., zero to 10,000 feet, a K-24 camera could be installed, permitting maximum speed photography. All cameras were electrically operated with either an intervalometer or manual control. Just how often these cameras were used in actual operation is not known. The P-51H was assigned to one AAF recon squadron and several Air National Guard units with recon commitments, but none of the aircraft ever received an official designation of F-6H or RF-51H.

Engine runup of a "lightweight" Mustang on the North American ramp. (NAA)

The first NA-109 P-51D-5 sitting on the North American ramp with the second and third P-51Hs. This P-51D's rudder encompassed 2.33 square feet more area than that of production P-51Ds, but it is not the revised P-51H rudder either. The trim tab's top edge is parallel with the balance arm whereas the P-51H's tab was lowered almost a foot. (NAA 122-23-1A)

DEVELOPMENT AND TESTING

Bob Chilton, North American's "Ace" test pilot (this is North American's statement, and I defy argument), commented that by the time the P-51H was developed most of the bugs in airframe design had been worked out. The P-51H essentially was a P-51F with a longer fuselage and a modified canopy, all of which had been well tested. Chilton reported that he had less things come off the airplane while testing than he did while flying other models. He did lose the lower skin off a flap on one aircraft while in a 500-mph dive, "But no other bad things" (the aircraft was probably 44-64184, which was retained at Inglewood until August 1946 specifically for dive tests). "On other models," says Chilton, "we had lost horizontal tails and landing gear doors, resulting in loss of gear, wings, aircraft and life."

Static test project records, as furnished by the Air Force Museum, were undated during the early portion of the P-51H's development. The AAF had assigned Capt. H.G.E. Kaston and Lt. J.U. Kordenbrock to the North American factory at Inglewood to insure that the aircraft would conform to AAF specifications. But, as stated, their reports are undated, and for the most part, unsigned. The first seven tests and progress reports do date roughly between Jan. 3 and March 2, 1945, but are unspecific in content. Report number eight begins: "Structural Tests of the Wing and and Fuselage of the North American P-51H Airplane," and is dated March 10, 1945. These evaluations continued until May 22, 1945, when the landing gear was structurally tested. Ed Schmued, the P-51's designer, reported that all of these tests were of strictly routine nature and not noteworthy. All of the involved parts were retained at the North American plant.

The first records of testing at the Wright Field facility are dated June 19, 1945, and concern "Inspection of Wing Buckles on three P-51H Airplanes at Dayton Army Air Field, Vandalia, Ohio" (the tendency of the wing to buckle was an ongoing problem and would plague the aircraft through most of its operational history). This buckling, and the problems with the tail wheel were the P-51H's only real shortcomings. Pilots putting 9 gs on the airframe would also put in permanent wrinkles in the wings. Pilots pulling 9.5 gs were guaranteed by the Air Material Command that they would lose their wings, literally. By the first of November, one additional stress problem was noted, buckling of the rear fuselage. The skin at "fuselage longeron joints of station 187.2 cracked under excessive loads," but this was rectified by the installation of .015 gauge side panel assemblies (Morale splices).

For static tests at Wright Field 44-64177 was permanently assigned. Upon delivery to Wright on June 6, 1945, the aircraft was evaluated structurally piece-by-piece until Sept. 27, 1946, when it no longer existed per se and was scrapped. Wing static tests were accomplished on 44-64162 between April and November 1945 when it was returned to service (this aircraft was later lost while serving with the 64th FS). Propeller tests were accomplished on 44-64266. The Aeroproducts assembly had a few shortcomings which, as a result of testing, were all modified by in-the-field technical orders sent out from Wright. Capt. Bill Creech was assigned to the Service Test Division to run the accelerated tests on the disk brakes. While disk brakes were not new, the design used on the P-51H was. Creech is reported to have made 5,000 landings, braking to the point where the aircraft was about to nose over, and then having the temperature of the disk taken by a technician before taking off for another landing.

As a result of all this testing most of the deficiencies which showed up were corrected: adjustment of gunbay door latches, reinforcement of the trailing edge wing skin, beefing up the rear fuselage, stiffening of the main gear doors and redesign of their latches. Pilots were notified about inducing g forces beyond design limits. Unfortunately, there is no indication that anyone made an attempt to deal with the tail wheel problems.

In flight testing, Bob Chilton stated that the P-51H was "probably no better—no worse than other models as a test vehicle." He did say that he had less trouble with the engine and related equipment than with previous models due to the lead time established by the Merlin's previous history. The change in supercharger gearing required by the Simmonds control was a minor thing. The P-51H did evidence a directional stability weakness at small angles. This was partially rectified by improvements in the vertical stabilizer. Chilton remembers, "At

The first P-51H, 44-64160, torn down for inspection and an oil change on the North American ramp. The rib construction around the "dog-house" is noteworthy. (NAA courtesy of G.H. Balzer)

P-51H, 44-64415, National Advisory Committee for Aeronautics #130 with bomb and rocket racks removed and the gun ports sealed. (NASA)

Mach .74 all previous models would make like a porpoise. The P-51H could do .8 [its critical Mach] quite readily then would not porpoise but just protest with much buffet, rattle, shake [and] scare."

Service testing of the P-51H was conducted by the 611th BASUT at Eglin Field, Florida. The Project Officer was Capt. D.F. Casey and the Test Officer was Major D.E. Latane. Three P-51Hs, 44-64169, 70 and 71, were received on June 4, 1945, and the tests commenced on June 14. The tests continued through March 1, 1946, with the exception of the period between Sept. 21, 1945, and Feb. 27, 1946, when they were suspended due to restrictions on the use of water injection (the reasons for this have not been determined). During the period between June 4, 1945, and Sept. 21, 1945, one additional P-51H-5, 44-64395, was also evaluated. This aircraft was used as a baseline as it had received all of the modifications and improvements that were retrofitted on the -1s. No night flying or cold weather tests were attempted, however.

The original intent of these tests was to compare the P-51H in a "flyoff" against a P-51D, P-47N, and P-38L. But due to the end of WW II and the demobilization of personnel, there was no longer enough support staff to prepare the Thunderbolt and Lightning, so the tests were only made against the known qualities of the P-51D.

Initial testing consisted of solo performance runs at 5,000-foot increments between sea level and the aircraft's service ceiling, using various fuels and power settings, i.e., Military (3000 rpm and 61" hg) and War Emergency (dry, 3000 rpm and 67" hg, water injection not being approved initially). The three P-51H-1s were flown with AWF-28 100/130 grade fuel while the H-5 used the more exotic AWF-33 115/145 fuel. This P-51H-5 was rated as War Emergency, dry, 3000 rpm and 74" hg. These tests were followed by timed climbs to 30,000 feet using normal rated power (2700 rpm at 46" hg) through the categories of Military, War Emergency 100/130 fuel, and War Emergency 115/145 fuel with corresponding power settings. The P-51H required three minutes, 20 seconds less time to reach 30,000 feet than the P-51D when both aircraft were flown at 3000 rpm and 67" hg.

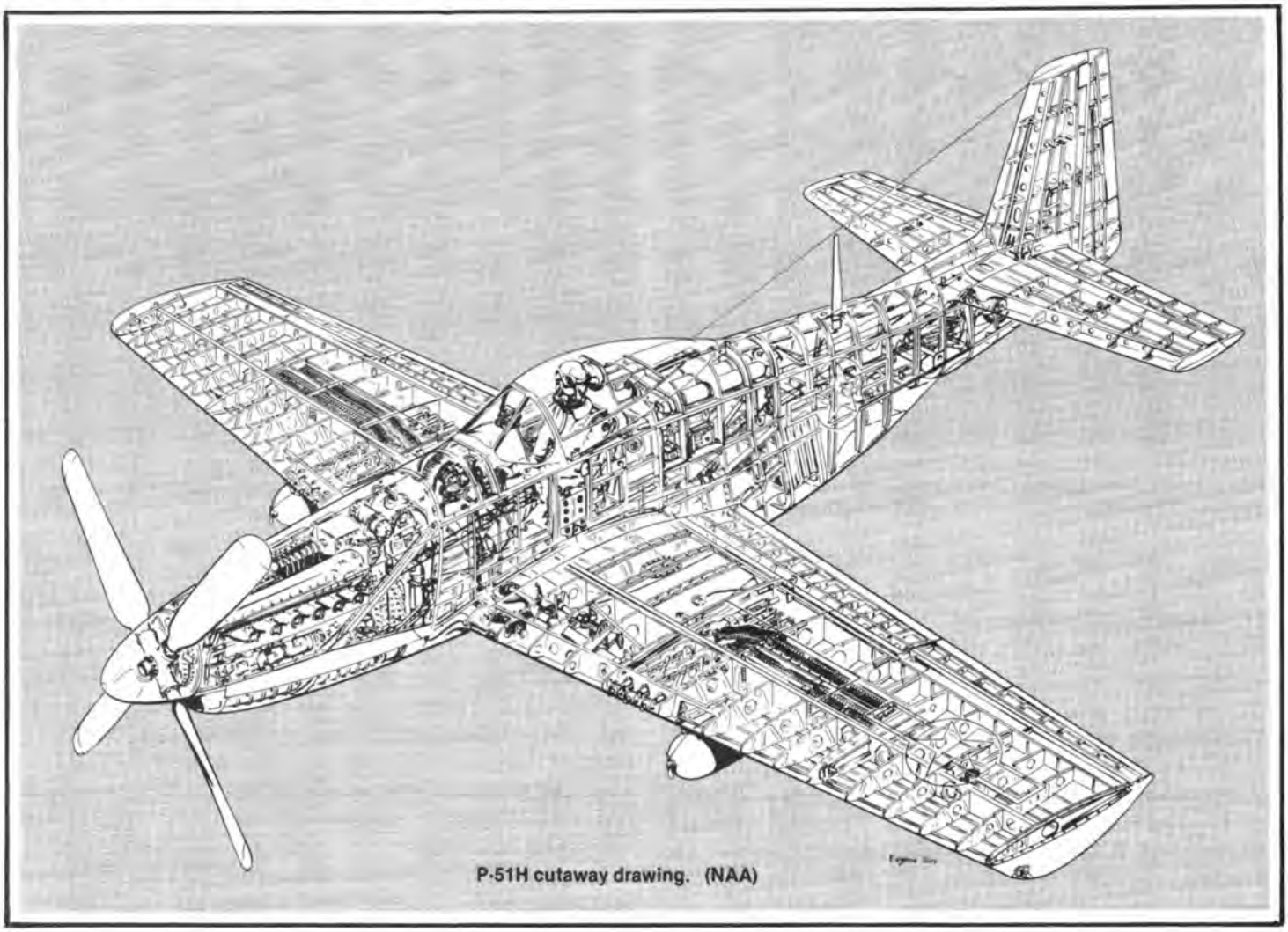
Range capabilities were explored by various simulated missions using 44-64169 which was equipped with a fuel flow meter. Power settings were adjusted to maintain 195 mph Indicated Air Speed (IAS) at 5,000, 10,000, and 15,000 feet (1650 rpm at 36" hg), or at 30,000 feet with 180 mph IAS. These flights included a letdown to sea level maintaining 180 mph IAS. To determine residual fuel, the internal tanks were alternated in flight and the remaining fuel measured after landing. After these missions established the baseline they were again flown with 110-gallon external drop tanks, and repeated with under-wing ordnance.

The ultimate aim, of course, was to establish a feasible criteria for combat mission lengths. These missions fell into three categories of escort and strafing, fighter sweeps, and fighter bomber roles. The simulated escort mission included full internal fuel plus two 110-gallon drop tanks and full ammunition trays. After a circle of Eglin Field, a climb on course was initiated at best cruise speed followed by a climb to 30,000 feet to pick up the simulated bomber force at a point approximately 150 miles from the intended target. These bombers would be escorted to the target area where the P-51H would be flown for 20 minutes at maximum power. A return leg was flown similarly to a point 150 miles from the target where the P-51H's speed was reduced from 300 mph IAS to 180 mph for the remainder of the flight. The maximum escort radius was found to be 945 miles with a fuel reserve of 40 gallons.

The fighter strike mission was also flown with full internal fuel, ammunition, 110-gallon drop tanks, and included six 5" HVARs. The test flights were made at 10,000 feet and were followed by a high-speed letdown over the target area where the aircraft was flown at maximum power for 15 minutes. The return leg was similar, being flown at optimum speed and altitude. The ideal range, again with a 40-gallon fuel reserve, was 925 miles.

The third test simulated a fighter-bomber strike with six 5" HVARs and two 500-pound bombs. The mission was flown as was the fighter strike and returned with the same fuel reserve. Without the benefit of external fuel the radius of action was reduced to 365 miles.

On all of these missions the combat radius of the P-51H was slightly reduced over that of the P-51D. This was due to the reduction of internal fuel capacity in the P-51H (269 vs. 255



P-51H cutaway drawing. (NAA)

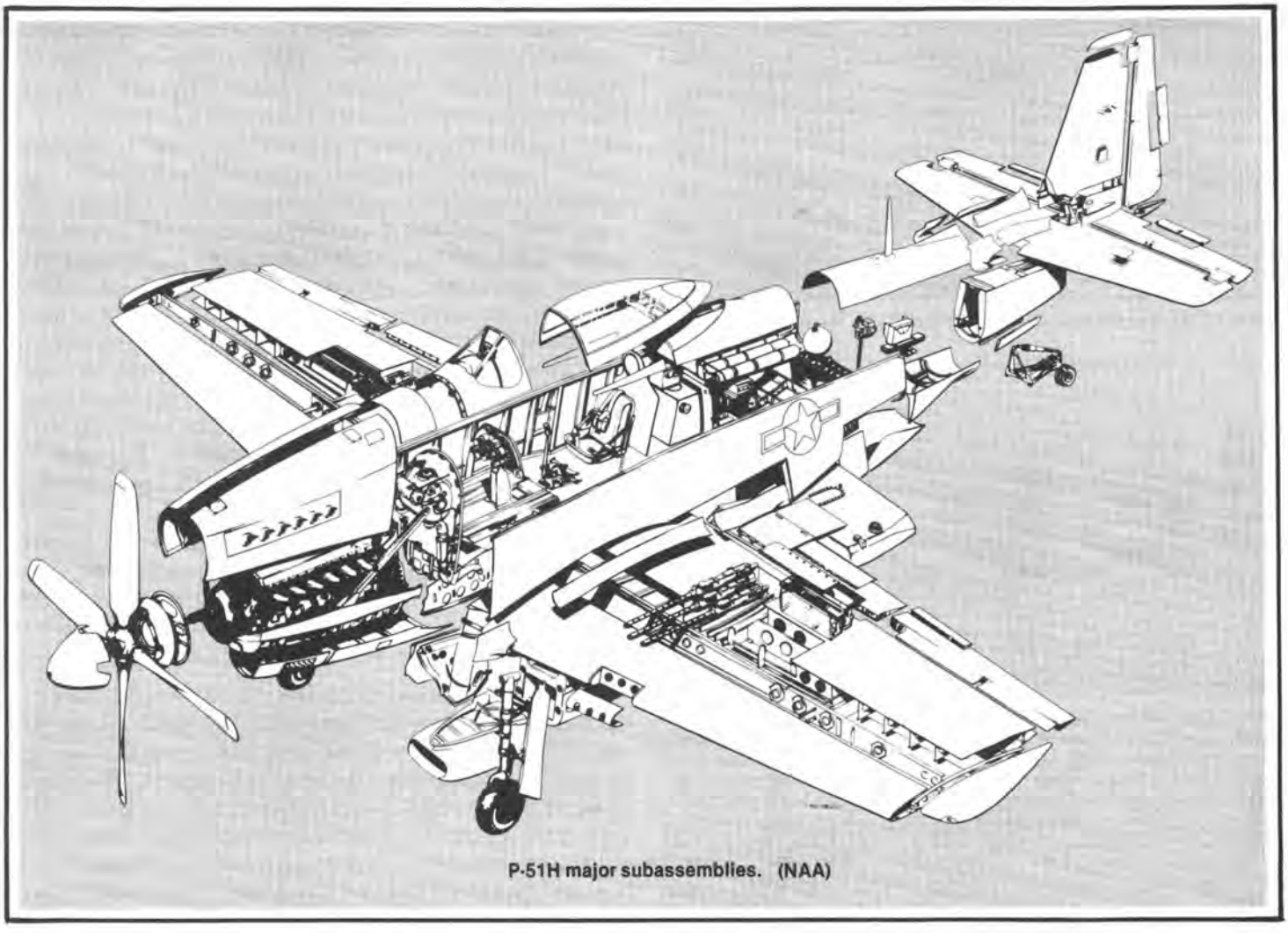
gallons). However, the P-51H was considered to be the better aircraft in these roles due to the design of the fuselage fuel tank overcoming the instability problems the P-51D pilots had to contend with. The revision in the cockpit layout had moved the seat further forward and the control stick slightly aft and this was viewed as a major improvement in creature comfort as it made the long-range missions less fatiguing. The visibility over the nose for deflection shooting was improved (approximately 10 degrees vs. 5 degrees), and also enhanced visibility during landing and taxiing. The consensus of the evaluating pilots was that the P-51H was easier to fly and was preferable to the P-51D as both a gunnery platform and a divebomber.

Since the P-47N and P-38L were not available to make combat comparisons, the P-51H was flown "one-on-one" against a P-51D-25. Flights were made at 10,000 and 25,000 feet. Comparisons were made between the rate of aileron roll, which since the furnished P-51H-1s did not have the revised "cusped" ailerons installed, was the same as the P-51D. In fact, above 400 mph the P-51D was actually quicker. The turning radii also were the same between the test aircraft, in spite of the "maneuvering flaps" installed on the P-51H.

With both the P-51D and the H limited to 67" hg and 3000 rpm there was no particular speed advantage gained by the P-51H below 25,000 feet. But above this altitude the P-51H was faster due to the improved supercharger. In reality, below 8,000 feet the P-51D was six mph faster, but these are comparisons made against an H without water injection: with water, the P-51H was flown at 80" hg and was faster at all altitudes (this, along with the end of WW II, may have had some bearing upon the canceling of the non-water injected P-51L). All performance flights were made at full military load, averaging 9,250 pounds at takeoff.

Acceleration in level flight and in dives showed the P-51H to be considerably faster, due to the greater power furnished by the improved Merlin. In zoom climbs the end result was the same, as by the time the airspeed had bled off to 130 mph IAS the P-51H held the altitude advantage. It was at this point where some problems were noted with the P-51H powerplant, as it was found to be sensitive to "ram effect on power," as the manifold pressure decreased materially. This problem had also been noted during the range tests, but to a lesser degree. The phenomenon usually occurred when the throttle was wide open with low cruising rpm settings. The surge could be violent and "particularly objectionable in the high blower range." But it was found that either a slight increase in rpm or reduction of throttle would cure the problem.

During the testing for stability and handling characteristics, the unmodified P-51H-1s were found to have some definite shortcomings. The elevators were extremely sensitive and created a porpoising action during high-speed dives near critical Mach (note contrast in opinion to Bob Chilton's statement here). The elevator trim tabs did not have sufficient area to assist in keeping



P-51H major subassemblies. (NAA)

the aircraft in trim during maximum power climbs either. However, these areas were all tackled by North American engineers and were rectified in the P-51H-5s and -10s production run and in field modification to the P-51H-1s.

The final report on the service tests of the P-51H was signed off by Major General Donald Wilson on 6 Oct. 1946, 11 months after production was terminated. The consensus of the evaluation was brief: the H was an acceptable, but not desirable, replacement for the D model unless the use of water injection and manifold pressures exceeding 67" hg were permitted. It was also noted that during evaluation periodic failures occurred with the tail wheel down-locks causing the wheel to collapse during taxiing and landing. Wilson stipulated that a more satisfactory down-lock must be provided—but it never was.

One hundred and sixty-three P-51Hs were out of the inventory by the end of 1951. Closing comments on the record cards are sometimes a cryptic "washout," or "reclaimed," others, as 44-64511, an epitaph, "depart US." The rate of writeoffs was extraordinarily high, but it was atypical for the era. During the years between WW II and Korea, pilot training, attitudes, maintenance, and equipment in general just were not of the standards we enjoy today. In 1948 the Air Force had an accident rate of 40 per 100,000 flying hours. The 1949 P-51 accident rate was 93 per 100,000 and the 1950 rate jumped to 109 for each 100,000 flying hours. The 1977 Air Force rate had dropped to 2.8 for all types of flying, while the 1978 statistics for tactical aircraft show that the F-15 had a loss rate of 6.6 for its first 100,000 flight hours (the F-104 rate for its first 100,000 hours was 46.0, and the F-4 was 24.8).

Of course, not all of the P-51Hs written off were due to accidents. Testing and evaluations accounted for 15 aircraft, which were never intended for squadron service in the first place. Two were destroyed at the Aberdeen Proving Ground in armament vulnerability tests (44-64165 and 168). 44-64160, the first production H, went to Chanute Field, Ill., to establish the training program for mechanics, and then was returned to Inglewood for further testing and eventual disposal by North American. P-51H-160 was replaced by 44-64265 as an instructional airframe, and remains at Chanute as a display item today.

While still on the subject of testing there remains the mystery of the P-51H-1 that numerous publications have reported as being supplied to the Royal Air Force as KN987. Most sources state that this aircraft was delivered to the RAF in March 1945. The allocated aircraft, 44-64181, was delivered to the AAF on June 13, 1945, after spending the previous month at the pre-modification center. It was flown to Newark, N.J., and assigned to the Atlantic Overseas Technical Service Command. Remarks on the individual aircraft's record card state that the project and destination was changed to McDill Field, Tampa, Florida, on Jan. 22, 1946. At this time there is no evidence that the aircraft ever departed this country.

View of the business end of the P-51H with its six 50-cal. guns. (USAF 29848 AC)

P-51H, Navy BuAer 09064, being flown by Lt. K. Kulig near Grumman Field, Long Island, New York. Note additional pitot tube under left wing and modification made to leading edge of wing. The 82nd Fighter Group field number "60" has been removed from the fin cap, as well as the airplane's data block. (Roger Besecker collection)

P-51H, 44-64192, on bailment to the Navy as BuAer 09064 but still bearing the markings of the 82nd Fighter Group. (Robert O'Dell)

P-51H, 44-64183, was written off on July 19, 1945. It appears that the pilot attempted to recycle the landing gear from a mid-position in its travel. The end result was a pair of crushed wheel well covers, jammed landing gear, and one less P-51H. (NAA courtesy of Gene Boswell)

Gene Boswell, Public Relations for Rockwell International, nee North American Aviation, stated that there was always the possibility that the aircraft was tested in this country for the RAF. Ed Schmued remembers that it may have been one in a group of 20 Mustangs that were intended for overseas shipment during the spring of 1945. He also thought that there may have been intentions of re-engining it with a Rolls-Royce Griffon (this surely would have been an interesting concept, particularly now that the RB-51 with the Griffon engine has established a new world's speed record. 499.1 isn't too bad for a 34-year-old Mustang!). The question remains open whether #181 actually went overseas between June 1945 and January 1946, or whether it was stored at Newark for the duration. The RAF does not have a record card on any aircraft serialing KN987. Only North American's records and various publications list this serial. The letter block allocation of KN is for the 77th Squadron, RAF, and the whole block series KA through KZ is for Lend Lease aircraft. I welcome further information.

At this point it might be worth mentioning that possible discussions took place between North America and the Commonwealth Aircraft Corporation toward Australian production of the P-51H. If this was the case, then these discussions were at high management levels, and were not recorded.

The National Advisory Committee for Aeronautics (NACA), forerunner of the National Aeronautics and Space Administration (NASA), used three H model Mustangs. The first one was assigned to the Lewis Research Center at Cleveland, Ohio. It was 44-64702, but its NACA civil registration is not known. The Lewis facility is concerned with aircraft propulsion and provides technical support to military aviation. NASA has turned their historical records for this period over to the National Archives, but a search of pertinent files has not discovered any information on what use they made of this aircraft. On April 14, 1950, it was turned over to the 166th Fighter Squadron at Lockburne AFB. NACA did fly it for a total of 218 hours, and when it was stricken from the inventory it had only 446 hours total time on the airframe.

The second H assigned to NACA was 44-64703, and it bore the civil registry number NACA110. It was based at Moffett Naval Air Station, Calif., and was designated as an EF-51H (at this time the "E" designated "Exempt from Technical Order Criteria," and not "Electronic" as it does today). It was stricken from the roles entirely on April 13, 1950, "due to obsolescence of a particular type." It had only been flown for a total of 170 hours, but, again, without record of its functions.

The third NACA P-51H was 44-64415, bearing the registration NACA130. Its official record card is missing, although it appeared in the USAF computer records in 1951 as belonging to NACA at the time. This Mustang was still on government rolls long after all the other Hs had gone to their reward, being photographed in 1958 at Moffett. This was the most extensively used P-51H by NACA at their Ames Research Facility, although it is possible that it may have been used in conjunction with, or as a replacement for, NACA110.

The primary research conducted with NACA130 was in comparison testing between swept wing jet aircraft and propeller-driven straight-wing fighters. The Mustang was flown along with a Grumman F8F and against an F-86A and F-86E, which compared two straight-wing types of characteristics against two swept-wing aircraft of unknown values. The object of the

P-51H, 44-64420, was flown twice on August 31, 1945, by Lt.Cdr. Bob Elder to determine whether the P-51H was an improvement over the P-51D in respect to aircraft carrier suitability. There were no special modifications made for these trials. (David Menard collection)

research was gunsight tracking and the dynamic response and control characteristics, i.e., whether the pilot could maneuver against an also maneuvering opponent with enough accuracy and stability to shoot him down. Through statistical analysis of tracking errors, as revealed by gun camera film, NACA was able to ascertain what future requirements would be, and assist in their development on later production aircraft.

Two additional P-51Hs had more than the usual role expected from an Air Force fighter. They flew for the Navy. In May 1943 the U.S. Navy obtained a P-51A, which actually was a Mustang IA, 41-37426 (FD524), and commenced land-based carrier trials. As this aircraft was found unsuitable, they then obtained a P-51D, 44-14017, and ran both land and carrier-based trials, but this aircraft was also declared unsuitable, primarily because of the lack of available rudder at low airspeed, particularly at the high angles of attack required for carrier landings. When the P-51H became available the Navy decided to continue the testing program and Lt. Commander Bob Elder, who had flown the P-51D trials, received 44-64420. He made two flights on Aug. 31, 1945, from the Naval Air Facility, Mustin Field, Philadelphia, Pa. Each of these flights was of a 30-minute duration. The first one was solely for Elder's benefit, to ascertain the flying qualities of the new type Mustang. The second flight was to determine the actual suitability of the P-51H for carrier missions. Elder stated, "These were land-based trials with an unmodified H model which verified that acceptable directional control was provided by the increased area of the vertical stabilizer and rudder surfaces. There were no special modifications to the airplane." Since WW II was already over, curiosity was satisfied, and the program was terminated. Whether North American Aviation had developed plans for a naval version of the P-51H cannot be verified, but it remains within the realm of possibility that a fully navalized version with folding wings did get at least as far as the planning stages.

The second P-51H used by the Navy was 44-64192, which became for awhile BuAer 09064. This H was an ex-82nd Fighter Group aircraft which was assigned to the Navy when the 82nd re-equipped with P-51Ds in 1948. It was sent to Langley Field, Va., under Project NAV-4 on June 30, 1948, and became "a specially instrumented aircraft with unique airfoil sections which could create transsonic airspeed. Airfoils/assemblies, etc., were mounted on special fixtures and the aircraft was flown to obtain desired conditions." Grumman Aircraft Corporation obtained this aircraft from Langley after the requested modifications had been made and operated it from their Bethpage, L.I., N.Y., airfield until 1952. While undergoing airwork on the FIOF Jaguar program, company pilots put on 659 hours of flying time on it without any major difficulties. It was reassigned from the Navy to the Air National Guard, and after a short period with the 148th FBS, Pennsylvania ANG, it was transferred to the 170th FPS, Illinois ANG, where it finished its service life.

Part II of the P-51H story, a detailed description of the airplane's use by Air Force combat units, will be published in the fall *Journal*.

Cockpit of P-51H-1NA, 44-64170. (NAA 126-30-12 courtesy G.H. Balzer)

Right side of cockpit of P-51H showing IFF panel and oxygen system indicators. (NAA 126-30-2B courtesy of G.H. Balzer)

On Feb. 6, 1945, Bob Chilton's birthday, the first P-51H, 44-64160, suffered a propeller failure. Chilton force landed near the Hollywood Race Track, touching down just short of a ditch, shedding the radiator and doghouse on the bank, followed by the prop. The airplane was a write-off, but was used as an instructional airframe for two years before being scrapped. (NAA courtesy of Gene Boswell)

BIBLIOGRAPHY

Carson, Leonard "Kit," *Pursue & Destroy*, Sentry, Granada Hills, CA 1978.

Cross, Roy and Gerald Scarborough, *P-51 Mustang, Classic Aircraft #3*, Airfix Products Ltd., London 1973.

Freeman, Roger A., *Mustang at War*, Doubleday, New York, 1974.

Green, William, *Famous Fighters of the Second World War*, Hanover House, Garden City, 1960.

Green, William, *Fighters, Vol. 4*, Hanover House, Garden City, 1961.

Gruenhagen, Robert, *Mustang, The Story of*, Arco, New York, 1969.

Hardy, M.J., *The North American Mustang*, Arco, New York, 1978.

Hess, William, *P-51 Mustang*, Ballantine Books Inc., new York, 1971.

Hess, William, *North American P-51 Mustang*, Aero Series, Aero Publishers Inc., Fallbrook, CA, 1967.

Morgan, Len, *The P-51 Mustang*, Famous Aircraft Series, Morgan Inc., Dallas 1963.

Robertson, Bruce, Editor, *United States and Navy and Marine Corps Fighters 1918-1962*, Harleyford Publications Ltd., Letchworth Herts, 1962.

Robertson, Bruce, Editor, *United States Army and Air Force Fighters 1916-1961*, Harleyford Publications Ltd., Letchworth Herts, 1961.

Hess, William, *Fighting Mustang: The Chronicle of the P-51*, Doubleday & Co., Inc., New York, 1970.

Swanborough, F.G., *United States Military Aircraft Since 1909*, Putnam, London, 1963.

Thetford, O.G. and E.J. Riding, *Aircraft of the Fighting Powers, Vol. VII*, Harborough, Leicester, England, 1946.

Published Sources

"Aircraft Propulsion," Robert W. Koenig. Lewis Research Center, NASA, Cleveland, Ohio. No date.

"NASA Technical Memorandum," NASA TM X-52354, "Aeronautics in Review: Aviation in Historical Perspective," James F. Connors, Lewis Research Center, NASA, Cleveland, Ohio. Sept. 1967.

"Adventures in Research," NASA SP-4302, "A History of Ames Research Center 1940-1965," Edwin P. Hartman, 1970.

Unpublished Source:

"The F-51H in Quarter Inch Scale," Al Keller, Elyria, Ohio, 1977.

Miscellaneous Publications:

SPRU Quarterly, International Plastic Modelers Society, Lawrence, Mass. 1976.

U.S. Army Aircraft 1908-1945, Fahey, Ships & Aircraft, New York, 1946.

USAF Aircraft 1947-1957, Fahey, Ships & Aircraft, New York, 1956.

Commanders Digest, Dept. of Defence, Vol. 2, #13, Washington, Aug. 3, 1972.

North American P-51 Mustang, Air-Age Inc., New York, 1958.

Flight Handbook, USAF Series F-51H Aircraft, 25 Feb. 1954.

Pilots Handbook, U.S. Army Air Force Report No. NA-8199 XP-51F Airplane, June 15, 1944.

Pilots Handbook, U.S. Army Air Force Report No. NA-5998 XP-51G Airplane, July 28, 1944.

Pilots Handbook, U.S. Army Air Force Report No. NA-8057 XP-51J Airplane, Feb. 20, 1945.

Handbook, Erection & Maintenance Instructions, USAF Series F-51H-1, -1, 5-10, 1948.

Standard Aircraft Characteristics F-51H, Air Material Command, USAF, 3 July 1950.

Airplane Features, North American Aviation, F-51H, no date.

North American Report 'O', Airframe Contract Record, July 27, 1956.

Static Test Project Record, File No. PR-45-21 P-51H airplane, no date.

Static Test Project Record, File No. PR-45-1 P-51H airplane, no date.

Static Test Project Record, File No. P-45-M7 P-51H airplane, no date.

Final Report on Service Test of the P-51H Airplane, Project No. G-45-2-4, Headquarters Air Proving Ground, Eglin Field, Fla., 10 May 1946.

Human Factors in F-51 Major Aircraft Accidents, Office of the Inspector General, Norton AFB, Calif., 22 Jan. 1952.

Personal Correspondence and Acknowledgments

Col. Ralph Bush, Headquarters Illinois Air National Guard, Springfield, Ill.

Col. Robert Mason, 125th Fighter Interceptor Group, Florida Air National Guard, Jacksonville, Fla.

Col. John A. deVries, USAF (Ret.), Colorado Springs, Colo.

J.C. Hopkins, Chief, History Division, HQ SAC, Offutt AFB, Nebr., Sept. 1977.
Grant M. Hales, Command Historian, Alaskan Air Command, Elmendorf AFB, Alaska.
Gene Boswell, Rockwell International, Public Relations, Los Angeles, Ca.
Air Force Museum, Dayton, Ohio.
Roger D. Hubin, Air Material Command, McClelland AFB, Ca., Feb. 1977.
Dominick Pisanto, Research Librarian, National Air and Space Museum, Washington, D.C.
Darrell Skurich, Air Power Inc., Ft. Collins, Co. (AAHS member, restored N313H into N46WB).
Edward J. Horkey, Horkey & Associates, Inc., Tempe, Ariz.
H.J. Schonenberg, Historian, Grumman Aerospace Corp., Bethpage, L.I., N.Y.
Al Keller, Elyria, Ohio.
Dick Phillips, Historian, La Crosse, Wisc.
B.C. Reynolds, San Diego Aero-Space Museum, San Diego, Ca. Feb. 1978.
Ed Schmued, North American Aviation (Ret.), Rancho Palos Verdes, Ca.
David W. Menard, Historian/Photographer, Dayton, Ohio.
Roger F. Besecker, Historian/Photographer, Allentown, Pa.
Robert Esposito, Historian/Photographer, Somerdale, NJ.
David Ostrowski, Historian/Photographer, Fairfax, Va.
Paul Stevens, Historian/Photographer, Aurora, Ill.
John Seibert, General all-around support, Aurora, Ill.
Paul Coggan, President, Mustang International, RAF Watton, England.
Bob Chilton, North American Aviation (Ret.), Torrance, Ca.
Public Record Office, Kew, Richmand Surrey, England, Feb. 1977.
T. Heffernan, RAF Boscombe Down, England, Oct. 1977.
J.M. Bruce, Royal Air Force Museum, London, England, Feb. 1978.
Col. Robert Stone, Historian, Michigan Air National Guard Museum.
Judy Endicott, Librarian, Albert F. Simpson Historical Research Center, Maxwell AFB, Ala.
Col. W.H. Meyerholt, HQ Tactical Air Command, Langley AFB, Va.
Robert O'Dell, Historian/Photographer, Bridgewater, NJ.
Mitch Mayborn, Historian/Photographer, Dallas, Tex.
Norm Taylor, Historian/Photographer, Florence, S.C.
Stephen J. Roberts, Flight Test Engineering, Newark, Del.
Lt. Col. Donald E. Evett (Ret.), Historian, Goleta, Ca.
E. Hine, Imperial War Museum, London, England, Sept. 1977.
Margaret B. Livesay, 1361st Audiovisual Sq. USAF, Washington, D.C.
Steve Meyers, Airpower Inc., Chelan, Wa.
Ralph Brown, Historian/Photographer, Decatur, Ill.
Mildred W. Wiley, Historian, Aerospace Defence Command, Colorado Springs, Colo., Feb. 1978.
Roger G. Crewse, Reports & Analysis Division, Aerospace Safety, Norton AFB, Ca.

Published Air National Guard Unit Histories

"Salute to Aviation," 178th Tactical Fighter Group, 162nd Tactical Fighter Squadron, Ohio ANG.
"Future Minus 25," 110th Tactical Reconnaissance Group, 172nd Tactical Recon. Squadron, Michigan ANG.
"25th Anniversary," 183rd Tactical Fighter Group, 170th Tactical Fighter Squadron, Illinois ANG.
"1926-1976 Michigan," published by the Michigan Air National Guard Historical Association.
"111th 1973," published by the 111th Fighter Squadron, Texas ANG, Houston, Texas.
"Pennsylvania Air National Guard 1947-1972," published by the Headquarters Pennsylvania ANG.
"50 Golden Years, Illinois Air National Guard," published by the Headquarters Illinois ANG, Chicago, Ill.

Additional Air National Guard Units Responding

102nd Combat Support Group, Major Richard L. Perry, Information Officer, Mass. ANG.
175th Tactical Fighter Group, Capt. Eric J. Jasper, Information Officer, Maryland ANG.
157th Air Refueling Group, Lt. Col. William A. Grand, Information Officer, New Hampshire ANG.
145th Tactical Airlift Group, Capt. Eural C. Clippard, Information Officer, North Carolina ANG.
174th Tactical Fighter Group, Major William R. Currier, Information Officer, New York ANG.
103rd Tactical Fighter Group, M/Sgt. John J. McHugh, Information Technician, Conn. ANG.
182nd Tactical Support Group, T/Sgt. Joe Wietchamp, Information Technician, Illinois ANG.
181st Tactical Fighter Group, Capt. Robert Hall, Acting Information Officer, Indiana ANG.
Albert A. Eldridge, Chairman, Massachusetts ANG Historical Association.
Lt. Col. James L. Delaney, ANG Historian, Office of Air National Guard History, Alcoa, Tenn.

Periodicals

Combat Crew, "CINCSAC Comments, With View of Safety," B.Gen. Richard H. Ellis, Oct. 1977.
Combat Crew, "Black Pearl," Capt. Bruce Savaglio, Nov. 1977.
Air Trails, "P-51H Mustang," H.A. Thomas, Jan. 1946, pg. 58.
Skyways, "Planes That Almost Missed the War," N.F. Silsbee (Lt. Col. (Ret.).
Aviation, July 1945.
Model Airplane News, "Mustang Scale Nationals Winner," May 1955.
Interceptor, "The ADC Story," Richard F. McMullen, Sept. 1972.
The Aeroplane Spotter, "Military Prototypes -XII, The North American P-51F Light Mustang," Aug. 23, 1945.
Air Classics, "Mustang Roundup—The P-51 Saga," June 1972.
Air Classics, "Mustang Supreme, Part Two of the P-51 Saga," July 1972.
Flying, Nov. 1951.
Air Classics, "H Model Last of the Mustangs," Michael O'Leary, June 1974.
Air Classics Quarterly Review, "Military Mustangs, A Sword Through Freedom's Enemies," Vol. 2, No. 1, Spring 1975.
Wings, "The Making of the Mustang, Part II," 'Kit' Carson, June 1976.
Sport Aviation, "The P-51H," David Gustafson, Dec. 1978.
Air Force, "Pacific Fighter Planes," Aug. 1945.
Air Classics Quarterly Review, "Mustang Guardsmen," David R. McLaren, Vol. 5, No. 4, Winter 1978.
Interceptor, "ADC's Rarest Warhorse," David R. McLaren, Aug. 1978.
Aviation Week, "USAF Flexes Muscle at Idlewild," Aug. 9, 1948.

ABOUT THE AUTHOR

David R. McLaren is an Evaluation and Proficiency Development Specialist for the Federal Aviation Administration, Chicago Air Route Traffic Control Center. He now has more than 24 years' ATC experience in both the tower and en-route options, and believes it is much safer to control traffic than to be a pilot.

Primarily interested in the "lightweight" Mustangs, his aviation interests are directed toward P-51s in general, and military fighters between the end of World War II and the end of the Korean War. He belongs, in addition to the AAHS, to the AFA, AFHF, IPMS, and Mustang International. Free-lance magazine articles have appeared in *Old Cars, Air Classics, Interceptor*, and *Combat Crew*.

McLaren lives in Aurora, Illinois, with his wife and three children.