NATIONAL TRANSPORTATION SAFETY BOARD
Office of Aviation Safety
Washington, D.C. 20594

AIRWORTHINESS GROUP CHAIRMAN'S FACTUAL REPORT

May 15, 2018

A. ACCIDENT CEN17FA270

Location:	Cummings, Kansas
Date:	July 16, 2017
Time:	1017 Central Daylight Time (CDT)
Operator:	Mustang Historic Military Aircraft, LLC
Aircraft:	North American P-51D
Registration:	N251PW

B. AIRWORTHINESS GROUP

Chairman:	Clinton R. Crookshanks National Transportation Safety Board Denver, Colorado
Member:	Sam Taber Tab-Air, Inc. East Troy, Wisconsin

C. SUMMARY

On July 16, 2017, about 1017 central daylight time, a North American P-51D airplane, N251PW, was destroyed when it impacted trees and terrain 2.5 miles northeast of Cummings, Kansas. The airline transport pilot and passenger were fatally injured. The airplane was destroyed. The personal flight was conducted under the provisions of 14 *Code of Federal Regulations P*art 91. Visual meteorological conditions prevailed and no Federal Aviation Administration (FAA) flight plan had been filed for the flight. The local flight departed the Amelia Earhart Airport (K59), Atchison, Kansas, about 1005.

According to several witnesses located between K59 and the accident site, the airplane was observed performing aerobatics at a high altitude. A witness, located further to the south of K59, and several hundred feet from the accident location, observed the airplane fly over nearby power lines between 25 ft and 30 ft above the ground. The airplane pitched up to climb in a near vertical

attitude and then the nose turned to the left and the airplane turned and pitched down in a nose low attitude. The airplane descended towards terrain and just prior to impacting the ground the tail of the airplane came up.

D. DETAILS OF THE INVESTIGATION

1.0 Airplane

The North American P-51D Mustang is an all metal (with the exception of some control surface skins), low wing, single seat, single engine, propeller driven airplane originally designed and built as a long-range fighter and used during World War II and the Korean War. The airplane was designed in 1940 by North American Aviation in response to a specification issued by the British Purchasing Commission. The first prototype flew on October 26, 1940 and the airplane entered production in 1941. Production of the P-51D variant began in April 1944 and more than 8,000 airplanes were produced. The stock airplane is 32 feet 3-5/16 inches long, has a level tail height of 12 feet, 2-1/16 inches, a wing span of 37 feet, 5/16 inch, and a conventional landing gear arrangement (Figure 1)[1]. The stock airplane empty weight is 7,635 pounds and the maximum gross weight is 12,100 pounds. The stock airplane has power off stall speeds of 94 mph and 87 mph in the clean and landing configurations, respectively, at a gross weight of 8,000 pounds. The accident airplane, Serial Number (S/N) 44-72086, was delivered to the Army Air Forces on January 20, 1945. The airplane was acquired by the current owner in 1996 and restored to airworthy condition in 2011. The airplane was painted in the markings of Capt. Herbert G. Kolb's "Baby Duck" from the U.S. Army 8th Air Force, 353rd Fighter Group, 350th Fighter Squadron. Figure 2 is a photo of the accident airplane prior to the accident.

The accident airplane was modified with a second seat aft of the standard pilot seat. The aft seat was equipped with a second set of flight controls that were installed in 1968 according to the records. The controls consisted of a control stick, rudder pedals without brake inputs, throttle lever, and a select set of flight instruments. There were no trim controls, landing gear controls, or radios in the aft compartment. The stock control stick, aileron torque tube, aft aileron fitting, and elevator push-pull tube were installed in forward and aft bearings on top of the upper wing surface as originally designed. The elevator bell crank on the flap torque tube was redesigned to accommodate the aft control stick. The aft control stick and elevator bell crank were directly connected to the aft end of the elevator push-pull tube and the aileron controls were connected to the aileron torque tube through cables to a modified aileron fitting installed on the aileron torque tube forward of the aft bearing. There was an elevator inertia weight installed on the redesigned elevator bell crank.

2.0 Wreckage Examination

The group examined the airplane wreckage at the Wentworth Aircraft, Inc., facility in Lakeville, Minnesota, on October 11-12, 2017.

The airplane was highly fragmented with extensive damage to every part of the structure. The engine and propeller separated during the accident sequence and all the primary structure was fractured and separated into multiple pieces. All the major portions of the airplane were accounted for in the recovered wreckage from wingtip to wingtip and nose to tail.

[1] All figures are presented in Appendix A to this report.

The forward and aft flight control components were reconstructed to ascertain continuity. The controls were deformed, fractured, and separated in numerous places and all fractures had a dull, grainy appearance consistent with overstress separation. The upper portions of both the forward and aft control sticks were separated. The aft control stick and the forward control stick grip were identified. The lower end of the forward control stick remained attached to the socket fitting and the socket fitting was attached to the hinge point on the forward aileron torque tube fitting and the forward end of the elevator push-pull tube. The forward aileron torque tube fitting was fractured from the forward end of the aileron torque tube. The aileron torque tube was deformed and fractured in several places. The forward end of the aileron torque tube was fractured and separated coincident with the aft end of the forward aileron torque tube fitting. The forward aileron torque tube bearing and housing were intact and damaged and attached to a small piece of upper wing skin. The modified aileron torque tube fitting was fractured and separated from the aileron torque tube. The aft aileron torque tube bearing housing was fractured. The inner bearing race was attached to a small piece of the aileron torque tube that had fractured from the torque tube. The aft end of the aileron torque tube was fractured just aft of the aft bearing and not identified. The aft aileron torque tube fitting was fractured and separated from the aileron torque tube. The left and right arms of the aft aileron torque tube fitting were attached to the left and right inboard aileron quadrants through their respective linkages. The aileron linkages were connected to the middle holes in the aileron fitting arms corresponding to 12º of travel. The elevator push-pull tube was attached to the forward control stick at the forward end and bent and deformed along its length. The aft rod end was fractured from the elevator push-pull tube. The aft rod end was damaged and partially attached to the elevator bell crank at the aft control stick. The lower end of the aft control stick remained installed in the fitting and the fitting was installed on the elevator bell crank. The aft control stick fitting was installed on the elevator bell crank through a spherical bearing and the entire unit was installed on the flap torque tube. The left and right auxiliary aileron cables were intact from the aft control stick to the modified aileron fitting arms. The fitting arms were fractured from the aileron torque tube. The inertia weight and the upper elevator cable bracket were separated from the elevator bell crank. The inertia weight weighed about 19 pounds. The lower elevator cables were attached to the lower end of the elevator bell crank. The right lower elevator cable was cut about 28 inches aft of the bell crank and the left lower elevator cable was cut about 25 inches aft of the bell crank. The right and left upper elevator cables were attached to the separated upper elevator cable bracket. The right upper elevator cable was cut about 56 inches aft of the bracket. The left upper elevator cable was intact to the turnbuckle and measured about 72 inches to the turnbuckle. The cable extended about 70 inches aft of the turn buckle where it was fractured with a splayed, broom straw appearance consistent with tension overload.

All 4 rudder pedals were identified in the wreckage but each had separated from the mounting points. The trim quadrant was separated and identified in the wreckage.

The left inboard aileron cables remained attached to the inboard aileron quadrant and the outboard aileron cable was fractured from the outboard aileron quadrant. The total measured length of the left inboard aileron cables was about 205 inches and the left outboard aileron cable was about 64 inches. The maintenance manual specifies the total length of the inboard aileron cables at 206.5 inches and the outboard aileron cable at 64.5 inches. The right inboard aileron cables remained attached to the inboard aileron quadrant. The right upper inboard aileron cable was intact from the inboard aileron quadrant to the turnbuckle and measured about 104 inches. The right lower inboard aileron cable was fractured about 10 inches from the inboard end, the outboard portion was attached to the outboard

aileron cable. The total length of the right lower inboard aileron cable measured about 205 inches. The right outboard aileron cable was fractured at the outboard aileron quadrant and the total length measured about 62 inches. The fractured cable ends all exhibited a splayed, broom straw appearance consistent with tension overload

The empennage wreckage consisted of the left and right horizontal stabilizers, right elevator, vertical stabilizer, and aft fuselage. There was significant damage and deformation. The vertical stabilizer was fractured from the empennage but remained attached by the upper elevator cable. The tailwheel mechanism, left elevator, and rudder were separated from the empennage. The rudder was fractured into 3 pieces. The aft elevator bell crank was intact but deformed. The right elevator torque tube was fractured outboard of the bell crank and the rivets attaching the left elevator torque tube to the bell crank were sheared. The right horizontal stabilizer remained attached to the empennage and the left horizontal stabilizer was fractured from the empennage but remained connected by the elevator trim cables. The right elevator trim tab was a phenolic tab and the inboard third was separated along with portions of the trailing edge. The three hinges on the right elevator trim tab were intact and the trim actuator remained attached. The left elevator trim tab was a metal tab and remained attached to the left elevator. The three hinges on the left elevator trim tab and the trim actuator remained attached. Continuity was established from the elevator trim cables at the forward end of the empennage to the actuators on the left and right sides. The trim tab hinge screws were removed to check the prevailing torque in the lock nuts. The screws could not be engaged by hand into the lock nuts. The left and right elevator counterweights were partially attached to the elevators. The forward horizontal stabilizer fittings were P/N 73-21081 which corresponds to 2º of horizontal stabilizer incidence.

The left and right rudder cables remained attached to the bell crank in the empennage. The left rudder cable was cut about 20 inches forward of the bell crank and the right rudder cable was cut about 31.5 inches forward of the bell crank. The right upper elevator cable was attached to the elevator bell crank and intact to the turnbuckle about 64 inches forward of the bell crank. The right upper elevator cable was cut about 13 inches forward of the turnbuckle. The left upper elevator cable was attached to the elevator bell crank and was cut about 49 inches forward of the bell crank. The right lower elevator cable was attached to the elevator bell crank and intact to the turn buckle about 73.5 inches forward of the bell crank. The right lower elevator cable was cut about 17 inches forward of the turnbuckle. The left lower elevator cable was not conclusively identified in the wreckage. The bolt in the left lower elevator bell crank arm was intact but the fitting and cable end were missing. The maintenance manual specifies the length of the aft, upper elevator cables at 69 inches and the aft, lower elevator cables at 75 inches.

The propeller separated from the engine at the reduction gear box and one propeller blade fractured at the hub flange. All four propeller blades exhibited leading edge chunking and chordwise scratching on the camber side. The blower assembly was separated from the aft end of the engine. The first stage impeller blades in the blower were all bent clockwise. The impeller turns counter-clockwise in operation.

Both the left and right flaps were separated from the wing and there was no evidence to suggest the position of the flaps prior to the accident. The left landing gear was separated from the wing and the right landing gear was attached to a portion of the wing structure. There was no evidence to suggest the position of the landing gear prior to the accident.