Aviation Investigation Final Report

Location:	Burnet, Texas	**Accident Number:**	WPR18FA201
Date & Time:	July 21, 2018, 09:15 Local	**Registration:**	N47HL
Aircraft:	Douglas DC3	**Aircraft Damage:**	Destroyed
Defining Event:	Loss of control in flight	**Injuries:**	6 Serious, 1 Minor, 6 None
Flight Conducted Under:	Part 91: General aviation		

Analysis

According to the copilot, before takeoff, he and the pilot had briefed that the copilot would conduct the takeoff for the planned cross-country flight and be the pilot flying and that the pilot would be the pilot monitoring. The accident flight was the copilot's first takeoff in the accident airplane with it at or near its maximum gross weight. The pilot reported that he taxied the airplane onto the runway and locked the tailwheel in place and that the copilot then took over the controls. About 13 seconds after the start of the takeoff roll, the airplane veered slightly right, and the copilot counteracted with left rudder input. The airplane then swerved left, and shortly after the pilot took control of the airplane. The airplane briefly became airborne; the pilot stated that he knew the airplane was slow as he tried to ease it back over to the runway and set it back down. Subsequently, he felt the shudder “of a stall,” and the airplane rolled left and impacted the ground, the right main landing gear collapsed, and the left wing struck the ground. After the airplane came to a stop, a postimpact fire ensued. All the airplane occupants egressed through the aft left door.

Postaccident examination of the airplane revealed no evidence of any mechanical malfunctions or failures with the flight controls or tailwheel. Both outboard portions of the of the aluminum shear pin within the tailwheel strut assembly were sheared off, consistent with side load forces on the tailwheel during the impact sequence.

The copilot obtained his pilot-in-command type rating and his checkout for the accident airplane about 2 months and 2 weeks before the accident, respectively. The copilot had conducted two flights in the accident airplane with a unit instructor before the accident. The instructor reported that, during these flights, he noted that the copilot had directional control issues; made "lazy inputs, similar to those for small airplanes"; tended to go to the right first; and seemed to overcorrect to the left by leaving control inputs in for too long. He added that, after the checkout was completed, the copilot could take off and land without assistance; however, he had some concern about the his reaction time to a divergence of

heading on the ground.

Given the evidence, it is likely the copilot failed to maintain directional control during the initial takeoff roll. It is also likely that, if the pilot, who had more experience in the airplane, had monitored the copilot's takeoff more closely and taken remedial action sooner, he may have been able to correct the loss of directional control before the airplane became briefly airborne and subsequently experienced an aerodynamic stall.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

The copilot's failure to maintain directional control during the initial takeoff roll and the pilot's failure to adequately monitor the copilot during the takeoff and his delayed remedial action, which resulted in the airplane briefly becoming airborne and subsequently experiencing an aerodynamic stall.

Findings

Personnel issues	Aircraft control - Copilot
Aircraft	Directional control - Not attained/maintained
Personnel issues	Delayed action - Pilot
Personnel issues	Monitoring other person - Pilot
Personnel issues	Aircraft control - Pilot
Aircraft	Angle of attack - Capability exceeded

Factual Information

History of Flight

Takeoff	Loss of control on ground
Takeoff	Loss of control in flight (Defining event)
Takeoff	Collision with terr/obj (non-CFIT)

On July 21, 2018, about 0915 central daylight time, a Douglas DC-3 airplane, N47HL, was destroyed when it was involved in an accident near Burnet, Texas. The pilot, crew chief, and four passengers sustained serious injuries; one passenger sustained minor injuries; and the copilot and five passengers were not injured. The airplane was operated as a Title 14 *Code of Federal Regulations* Part 91 personal flight.

Representatives from the Commemorative Air Force (CAF) reported that all of the passengers were volunteers at the CAF wing and that the intention of the flight was to travel to Oshkosh, Wisconsin, to attend an airshow. An intermediate fuel stop was planned at Sedalia Regional Airport (DMO), Sedalia, Missouri.

The copilot reported that, during a discussion with the pilot before the flight, he told the pilot that his time in the airplane was low, that almost all his tailwheel time was in small airplanes. The pilot replied that “he was a 4,000-hour DC-3 pilot and that there weren't going to be any problems…if you could taxi it, you could fly it." Additionally, they briefed that the copilot would conduct the takeoff and be the pilot flying and that the pilot would be the pilot monitoring. The pilot stated that the airplane would be heavier than what the copilot was used to and that “it might be necessary to help the tail up.” He asked the copilot if he was “comfortable taking off with a heavy airplane,” and the copilot responded that he was.

The copilot stated that the pilot taxied the airplane to the run-up area, where they completed all pretakeoff checks and an engine run-up. The pilot then taxied the airplane onto runway 19. Subsequently, the copilot took control of the airplane, conducted a pretakeoff brief, and initiated the takeoff sequence. After the airplane began to move, he "applied some forward pressure on the control yoke." The pilot told him that he was applying the pressure too early, so he then slightly relaxed forward pressure on the control yoke. About 10 seconds into the takeoff roll, the airplane drifted right, at which time the copilot applied left rudder input, followed shortly after by the pilot taking control of the airplane.

The captain reported that, after taxiing to the runway, “he didn’t like how things looked, so he unlocked the tailwheel, let the…[airplane] roll forward 6 to 7 inches, relocked the tailwheel, and verified it was locked.” The pilot couldn’t recall whether, during the initial stages of the takeoff roll, if the airplane swerved right, but he did recall telling the copilot not “to push the tail up because it was heavy and that the airplane then swerved left. He then yelled "right rudder" three times. Shortly thereafter, he said, “my

airplane” and then took control of the airplane. As he put his hands on the control yoke, he noticed that either the tail had started to lower or that the main wheels had just lifted off the ground. He knew the airplane was slow as he tried to ease it back over to the runway and set it back down and then felt the shudder “of a stall." The airplane rolled left and impacted the ground, the right main landing gear (MLG) collapsed, and the left wing struck the ground. After the airplane came to a stop, a postimpact fire ensued. All the airplane occupants egressed through the aft left door.

The crew chief, who was seated behind the pilots, reported that, during the takeoff sequence, he was concentrating on the instrument panel and heard the pilot tell the copilot not to push forward on the stick and to let the tail come up naturally. About 3 to 5 seconds later, he heard the pilot say, "I have the aircraft." He said he looked outside and could see that they were on the far-left side of the runway and that the pilot was on the controls, moving the rudder pedals and ailerons.

A video recorded by a witness located on the airport’s ramp area showed that about 13 seconds after the airplane started the takeoff roll, it veered slightly right, and about 3 seconds later, it veered left. The airplane then exited the left side of the runway while turning right. The airplane briefly became airborne in a right-wing-low attitude before it rolled left. Subsequently, the left wing struck the ground, the airplane continued to yaw left as it impacted the ground, and the right MLG collapsed.

Pilot Information

Certificate:	Airline transport	**Age:**	61,Male
Airplane Rating(s):	Single-engine land; Multi-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Lap only
Instrument Rating(s):	None	**Second Pilot Present:**	Yes
Instructor Rating(s):	Instrument airplane	**Toxicology Performed:**	No
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	June 1, 2018
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	March 2, 2018
Flight Time:	12500 hours (Total, all aircraft), 2500 hours (Total, this make and model)		

Co-pilot Information

Certificate:	Airline transport; Commercial; Flight instructor	**Age:**	71,Male
Airplane Rating(s):	Single-engine land; Single-engine sea; Multi-engine land	**Seat Occupied:**	Right
Other Aircraft Rating(s):	Glider	**Restraint Used:**	Lap only
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane multi-engine; Airplane single-engine; Glider	**Toxicology Performed:**	No
Medical Certification:	Class 2 With waivers/limitations	**Last FAA Medical Exam:**	May 5, 2018
Occupational Pilot:	Yes	**Last Flight Review or Equivalent:**	May 4, 2018
Flight Time:	(Estimated) 8000 hours (Total, all aircraft), 17 hours (Total, this make and model), 30 hours (Last 90 days, all aircraft), 10 hours (Last 30 days, all aircraft)		

Pilot

The pilot reported over 4,500 hours of experience in tailwheel aircraft. The pilot last flew the DC-3 about 1 month before the accident.

Copilot

The copilot reported that he completed his DC-3 type rating training in May 2018, which included 8 hours in the DC-3, and 1.6 hours for a pilot-in-command (PIC) checkride. He added that, during this training, he never sat in the right seat. He recalled that the DC-3 was difficult to taxi but that he “felt that he never had issues” flying it because all the instrument approaches were standard. However, he did add that takeoffs and landings were "something you need experience with and practice with."

The copilot then conducted two flights in the accident airplane with a CAF unit instructor. He stated that he felt his takeoffs and landings were very different in the accident airplane and that it was "more squirrely" than the airplane in which he had trained.

The CAF unit instructor reported that the accident airplane was empty with 400 gallons of fuel onboard for their first flight and that the copilot flew the airplane from the right seat. The copilot had no issues in the air; they performed landings; and he helped the copilot through the systems, checklists, and procedures. During the second training flight, the instructor performed the first half of the flight with the copilot as the pilot flying and the second half of the flight with the copilot as the nonflying pilot. The instructor added that the copilot had issues with directional control on the ground, including that his control inputs were "lazy inputs, similar to those for small airplanes"; tended to go to the right first; and seemed to overcorrect to the left by leaving control inputs in for too long.

The instructor added that the copilot's first flight in the accident airplane was not satisfactory but that he had shown gradual improvement with directional control during the second flight. He signed off the

copilot because, during the second flight's debrief, the copilot's attitude was good, and his directional control of the airplane had improved. At the completion of the checkout, the instructor said that the copilot could take off and land without assistance; however, he had some concern about his reaction time to a divergence of heading on the ground.

Aircraft and Owner/Operator Information

Aircraft Make:	Douglas	**Registration:**	N47HL
Model/Series:	DC3 B	**Aircraft Category:**	Airplane
Year of Manufacture:	1943	**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	27203
Landing Gear Type:	Retractable - Tailwheel	**Seats:**	19
Date/Type of Last Inspection:	Unknown	**Certified Max Gross Wt.:**	33000 lbs
Time Since Last Inspection:		**Engines:**	Reciprocating
Airframe Total Time:		**Engine Manufacturer:**	Pratt & Whitney
ELT:	Installed, not activated	**Engine Model/Series:**	1830
Registered Owner:	American Airpower Heritage Flying Museum	**Rated Power:**	1200 Horsepower
Operator:	Commemorative Air Force	**Operating Certificate(s) Held:**	None

The airframe and engine logbooks, including the weight and balance, were onboard the airplane at the time of the accident and were destroyed by fire; therefore, the airplane’s weight and balance at the time of the accident could not be calculated. However, the CAF unit operations officer reported that the airplane was at or near its maximum gross weight.

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	KBMQ,1284 ft msl	**Distance from Accident Site:**	
Observation Time:	14:31 Local	**Direction from Accident Site:**	
Lowest Cloud Condition:	Few / 300 ft AGL	**Visibility**	9 miles
Lowest Ceiling:		**Visibility (RVR):**	
Wind Speed/Gusts:	9 knots / None	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	200°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30.07 inches Hg	**Temperature/Dew Point:**	29°C / 21°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	Burnet, TX (BMQ)	**Type of Flight Plan Filed:**	None
Destination:	Sedalia, MO (DMO)	**Type of Clearance:**	None
Departure Time:	09:17 Local	**Type of Airspace:**	Class G

Airport Information

Airport:	BURNET MUNI KATE CRADDOCK FIEL BMQ	**Runway Surface Type:**	Asphalt
Airport Elevation:	1284 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	19	**IFR Approach:**	None
Runway Length/Width:	5000 ft / 75 ft	**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	2 Serious, 1 None	**Aircraft Damage:**	Destroyed
Passenger Injuries:	4 Serious, 1 Minor, 5 None	**Aircraft Fire:**	None
Ground Injuries:		**Aircraft Explosion:**	None
Total Injuries:	6 Serious, 1 Minor, 6 None	**Latitude, Longitude:**	30.737222,-98.238609(est)

Examination of the accident site revealed that the airplane came to rest upright on a heading about 113° magnetic, about 145 ft east of the left side of runway 19, partially on the taxiway. (Figure 1)

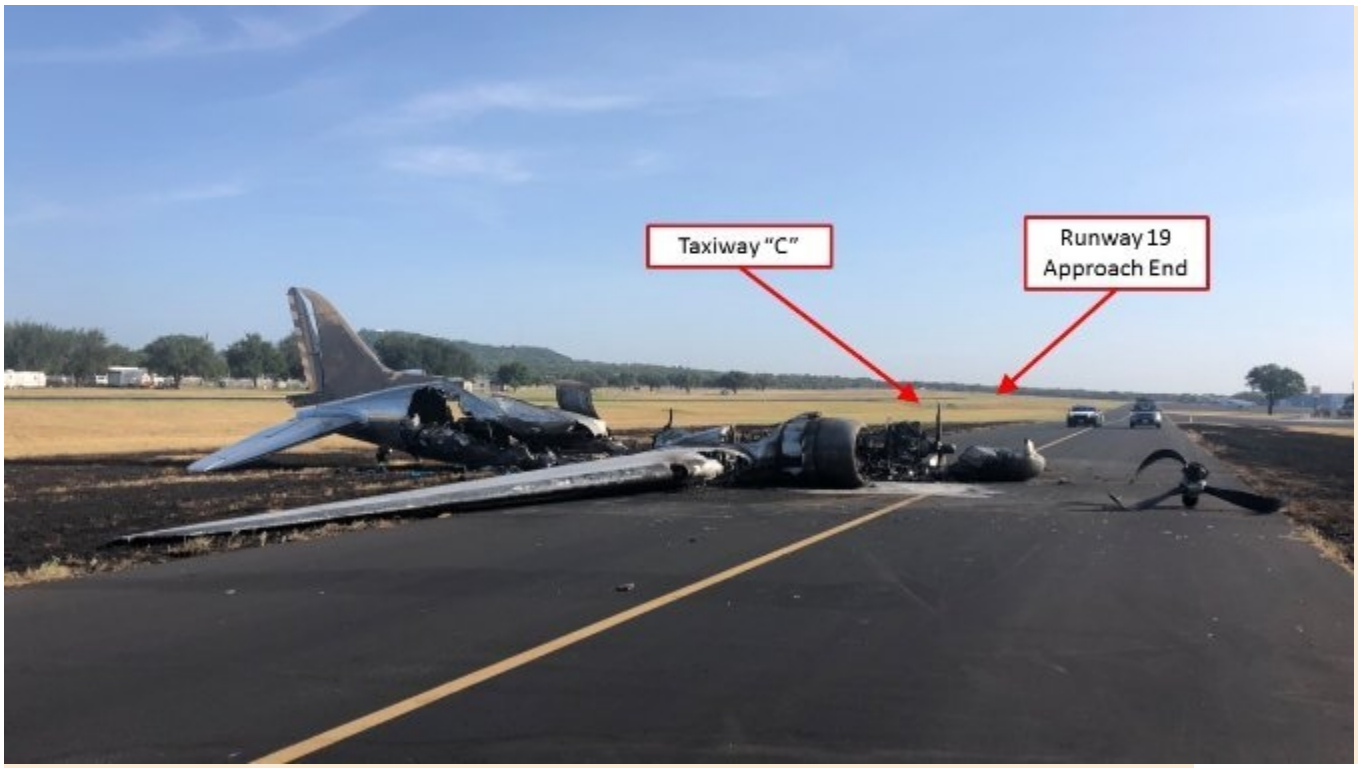

Figure 1. A photograph showing the main wreckage in relation to runway 19 and taxiway C.

During examination of the runway, a skid mark consistent with the right MLG tire, was observed about 843 ft from the approach end of the runway. The mark extended from slightly right of the runway centerline toward the 1,000-ft markers and moved progressively toward the right side of the runway. Beginning about 1,106 from the approach end of the runway, the skid mark began to move progressively left, and Its angle toward the left side of the runway started increasing.

A ground impression was observed left of the runway about 1,566 ft from its approach end, consistent with the right MLG exiting the left side of the runway. The impression then continued almost parallel to the runway until it reached a runway light, slightly beyond which the impression stopped. Another ground impression was observed about 2,111 ft from the approach end and extended parallel to the runway for about 200 ft, consistent with impact by the left wing.

Another ground impression was observed about 2,377 ft from the approach end of the runway, which extended from the wheel skid mark toward the main wreckage, consistent with the left MLG exiting the left side of the runway. See figure 2 for a photograph showing the wheel skid mark on the runway and the ground impressions left of the runway.

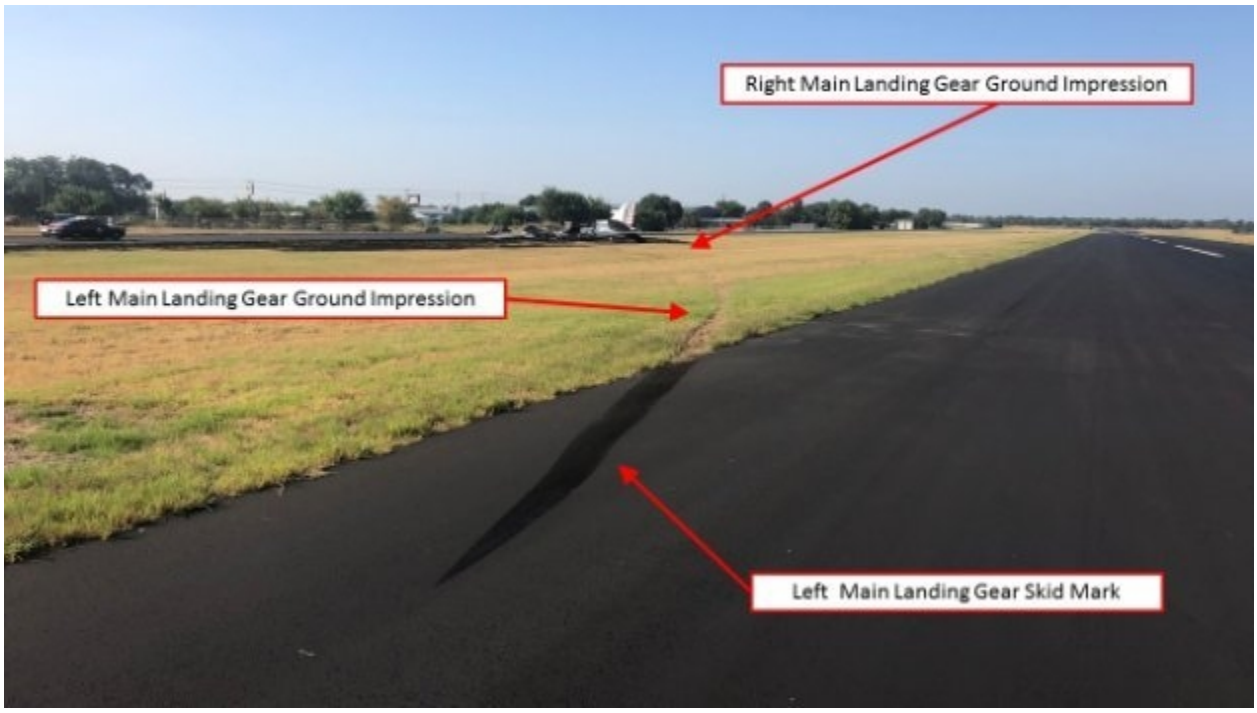

Figure 2. A photograph showing the left MLG wheel skid mark on the runway and the left MLG ground impressions left of the runway.

Another ground impression was observed about 2,436 ft from the approach end of the runway, consistent with the right MLG. The main wreckage came to rest about 2,638 ft from the approach end of the runway. (See figure 3 for an overhead view of the left MLG wheel skid mark, right and left MLG wheel impressions, and the left-wing impact mark locations.)

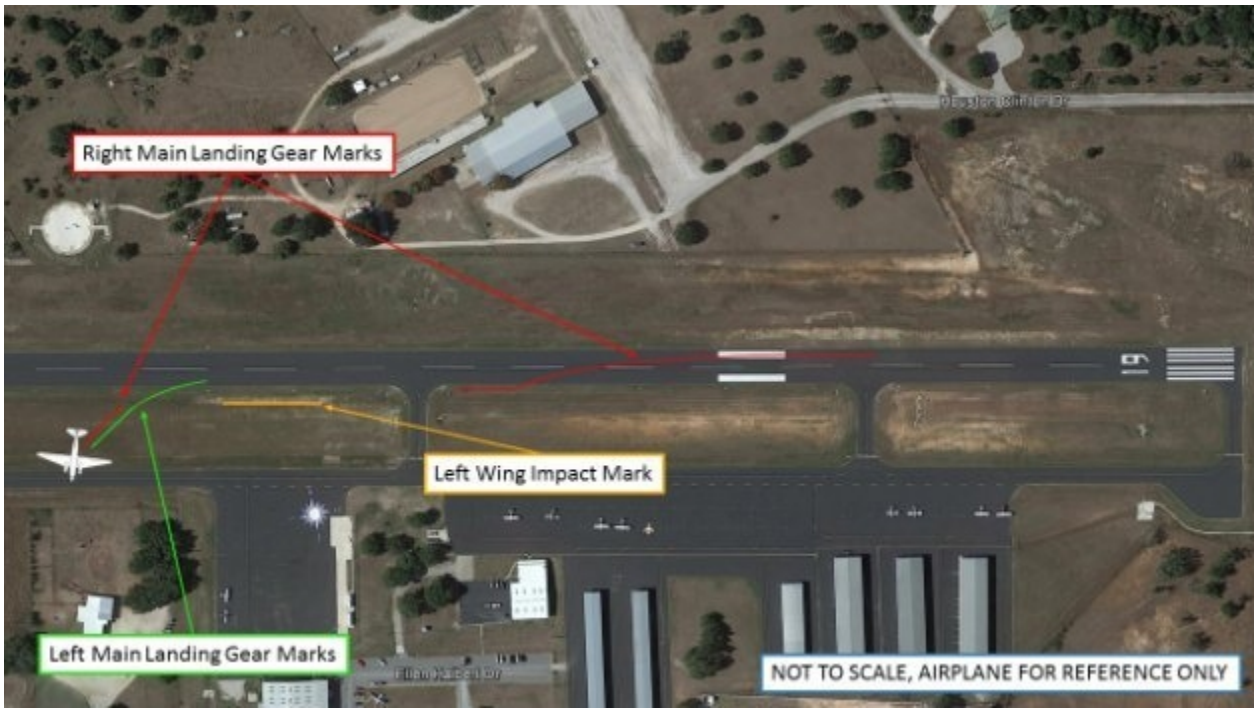

Figure 3. An overhead image of the right MLG wheel skid mark, the right and left MLG ground impressions, and the left-wing impact mark locations observed at the accident site.

Grass within about 200 ft of the main wreckage was burnt by postimpact fire, which consumed the fuselage from the nose cone aft to about 3 ft forward of the left cargo door. The wing center section of the fuselage was mostly consumed by fire and extended outboard to the right-wing attachment point and about 2 ft outboard of the left-wing attachment point. (See figure 4 for a photograph showing the main wreckage and postimpact fire damage.) All cables in the throttle quadrant remained attached but exhibited thermal or fire damage. The tailwheel lock engagement handle was not found.

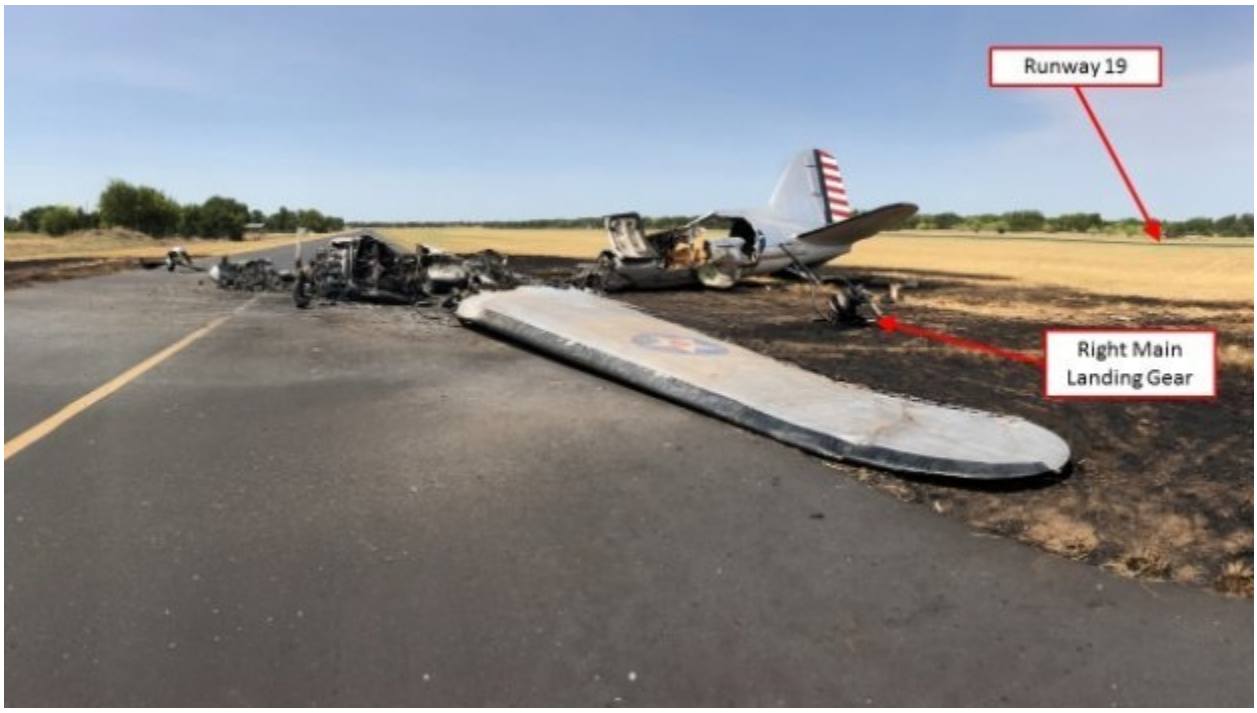

Figure 4. A photograph showing the main wreckage and postimpact damage.

The tailwheel remained attached to the airframe and was oriented about 45° left of the centered position. The tailwheel locking mechanism appeared to be in the locked position. The tailwheel locking cable remained attached to the mechanism and was continuous to about the fuel tanks area. The tailwheel locking shear pin remained within the tailwheel strut assembly; however, the outboard portions of the aluminum shear pin were sheared off and located in the fuselage near the tailwheel assembly. The rudder, vertical stabilizer and left and right horizontal stabilizers and elevators remained attached via their respective mounts and were undamaged. The rudder and elevator trim tabs remained attached and appeared to be in the neutral position.

Flight control continuity was established from all primary flight controls to the center section of the fuselage near the aft side of the fuel tanks and from about 2 ft forward of the fuel tanks to the control columns. No evidence was found indicating that any flight control lock had been installed. The pilot reported that there were no preaccident mechanical malfunctions or failures with the airplane that would have precluded normal operation.

Administrative Information

Investigator In Charge (IIC):	Cawthra, Joshua
Additional Participating Persons:	Frank G Fortmann; Federal Aviation Administration; San Antonio, TX Jim Lasche; Commemorative Air Force; Dallas, TX
Original Publish Date:	December 3, 2020
Last Revision Date:	
Investigation Class:	Class 2
Note:	The NTSB traveled to the scene of this accident.
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=97843