



National Transportation Safety Board Aviation Accident Final Report

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| Location: | RAMONA, CA | Accident Number: | LAX95GA219A |
| Date & Time: | 06/21/1995, 1108 PDT | Registration: | N4989P |
| Aircraft: | DOUGLAS C-54G | Aircraft Damage: | Destroyed |
| Defining Event: | | Injuries: | 2 Fatal |
| Flight Conducted Under: | Public Aircraft | | |

Analysis

A DOUGLAS C-54G & BEECH 58P WERE ON A FIRE SUPPRESSION MISSION WITH THE USDA FOREST SERVICE. THE C-54 (TANKER 19) WAS BEING USED AS AN AERIAL TANKER, WHILE THE BEECH 58 (LEAD 56) WAS ON A LEAD OPERATION. LEAD 56 DEPARTED THE FIRE AREA ABOUT 5 MINUTES BEFORE TANKER 19. BOTH AIRPLANES PROCEEDED TO AN UNCONTROLLED AIRPORT AT RAMONA, CA, FOR LANDING ON RUNWAY 27 WITH A 360-DEGREE OVERHEAD APPROACH. TANKER 19 WAS ON THE INITIAL APPROACH ABOUT 1 MILE EAST OF THE AIRPORT, WHEN THE TWO PLANES COLLIDED. INVESTIGATION REVEALED THAT LEAD 56 STRUCK THE VERTICAL STABILIZER OF TANKER 19, WHILE DESCENDING. THE EMPENNAGES OF BOTH AIRPLANES SEPARATED, & BOTH CRASHED IN UNCONTROLLED DESCENTS. BEFORE THE ACCIDENT, A GRUMMAN S2 PILOT WAS FOLLOWING TANKER 19. WHILE IN A SHALLOW DESCENT TO THE AIRPORT, HE SAW TANKER 19 SLIGHTLY BELOW THE HORIZON & HEARD TANKER 19 MAKE TWO CALLS (AT 8 & 2 MILES ON INITIAL APPROACH). HE ALSO HEARD A TRANSMISSION FROM LEAD 56 MOMENTS BEFORE THE COLLISION, BUT DID NOT SEE LEAD 56, NOR WAS HE WATCHING TANKER 19 WHEN THE COLLISION OCCURRED. INVESTIGATORS WERE UNABLE TO DETERMINE LEAD 56'S ACTIVITIES AFTER DEPARTING THE FIRE AREA. TRANSMISSIONS WERE HEARD FROM LEAD 56 ON THE FOREST SERVICE TACTICAL (OPERATIONS) FREQUENCY WHEN THE PLANE WAS WITHIN 10 MILES OF THE AIRPORT. MOMENTS BEFORE THE COLLISION, LEAD 56 WAS HEARD ON THE AIRPORT'S COMMON TRAFFIC ADVISORY FREQUENCY (CTAF). FOREST SERVICE PROCEDURES REQUIRED THAT ALL PILOTS TRANSMIT THEIR POSITION ON THE CTAF WITHIN 10 MILES OF THE AIRPORT. THE FOREST SERVICE HAD NOT MADE ARRANGEMENTS WITH THE AIRPORT MANAGER TO PERFORM OVERHEAD APPROACHES, NOR WERE PARAMETERS PUBLISHED FOR INITIAL APPROACH ALTITUDE OR AIRSPEED.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: INADEQUATE VISUAL LOOKOUT BY THE BEECH 58P PILOT, AND THE OPERATOR'S

INADEQUATE PROCEDURES CONCERNING 360-DEGREE OVERHEAD APPROACHES.

Findings

Occurrence #1: MIDAIR COLLISION

Phase of Operation: APPROACH

Findings

1. (C) VISUAL LOOKOUT - INADEQUATE - PILOT OF OTHER AIRCRAFT
2. PROCEDURES/DIRECTIVES - NOT FOLLOWED - PILOT OF OTHER AIRCRAFT
3. (C) PROCEDURES/DIRECTIVES - INADEQUATE - COMPANY/OPERATOR MANAGEMENT

Occurrence #2: IN FLIGHT COLLISION WITH TERRAIN/WATER

Phase of Operation: DESCENT - UNCONTROLLED

Factual Information

History of Flight

On June 21, 1995, at 1108 hours Pacific daylight time, a McDonnell Douglas C54G, N4989P, and a Beech B58P, N156Z, collided about 1 mile east of Ramona Airport, Ramona, California. N4989P was registered to and operated by Aero Union Corporation, Chico, California; N156Z was registered to and operated by the USDA Forest Service (herein referred to as Forest Service), Boise, Idaho. Both airplanes were engaged in aerial fire suppression activities; N4989P was operating as Tanker 19, and N156Z was operating as Lead 56. Both airplanes were destroyed by impact forces and the resulting postimpact fire. Two residences, a water tank, and two vehicles were also destroyed. The two flight crewmembers aboard Tanker 19 and the certificated airline transport pilot aboard Lead 56 sustained fatal injuries. Visual meteorological conditions prevailed. Lead 56 departed Ontario Airport, Ontario, California, at 0800 hours; Tanker 19 departed Hemet-Ryan Airport, Hemet, California, at 1022 hours.

Both airplanes were engaged in fire suppression activities over the Butterfield Ranch about 30 miles northeast of Ramona Airport. After departing Ontario Airport, Lead 56 flew over the fire area and conducted fire spotting and led several air tankers to specific drop areas. Lead 56 remained over the area until relieved by another Forest Service airplane, Lead 55, at 1100 hours.

Tanker 19 departed Hemet-Ryan Airport on its initial fire suppression activities over the Butterfield Ranch at 0845 hours. Tanker 19 made two fire retardant drops and returned to Hemet-Ryan Airport for additional fire retardant chemicals. Tanker 19 landed at Hemet-Ryan Airport at 0927 hours and then departed at 1022 hours. After arriving over the Butterfield Ranch fire, Lead 56 instructed all tankers to orbit over the desert, about 6 miles northeast of the fire area.

About 1050 hours, Lead 55 with two pilots on board relieved Lead 56. Lead 56 briefed Lead 55 on the fire suppression status and then flew to Ramona Airport. At 1058 hours, Lead 55 instructed all tankers, except Tanker 153, to return to Ramona Airport; Tanker 153 returned to Hemet-Ryan Airport.

Lead 55's pilot said that before departing the fire area he called all tankers on the tactical frequency to assure that they responded to his release instructions. All the tankers, except Tanker 19, immediately responded. Lead 55's pilot again called Tanker 19, and Tanker 19 then acknowledged the instructions.

Lead 55's pilot said he heard Lead 56 transmit that he was 9 miles out and requested fuel on the helicopter's fire operations frequency. Moments later, Lead 55's pilot switched to the air tankers' operations frequency and heard Lead 56 call for fuel. Lead 55 asked Lead 56 to order fuel for his airplane, but did not receive a response.

Lead 55's pilot then said he heard Lead 56 in the traffic pattern making some radio transmissions, and then said he thought he heard Tanker 19 reporting on initial approach about 8 miles east of the airport. After hearing Lead 56's calls, the check pilot aboard Lead 55 said "midair, midair." Lead 55's pilot said that he only saw a small flash followed by a large fire ball from the crash site. Lead 55 was between 2 - 3 miles east of the airport.

After seeing the fire ball, Lead 55's pilot said that he observed a Grumman S2 aircraft making a

left crosswind turn over the airport and a small general aviation airplane departing the area toward the north. Lead 55 then instructed all tankers to climb and divert to Hemet.

The check airman aboard Lead 55 told National Transportation Safety Board investigators that he heard Lead 56 transmit over the Ramona Airport's common traffic advisory frequency (CTAF -- 122.7 MHz). The pilot reported that he was on initial approach to runway 27 for a 360-degree overhead approach. The check airman then told Safety Board investigators that Lead 56's transmission was made on the helicopter's fire operations frequency, 123.975 MHz. He said that he did not observe Lead 56 and did not hear Tanker 19 make any transmissions.

When Lead 55 was about 5 miles behind Tanker 19, the check airman said he saw a general aviation airplane on the downwind leg, and another airplane on the base leg behind Tanker 19. Moments later, he saw Tanker 19 pitch up to a near vertical nose-up attitude and then nose down and descend uncontrolled. The check airman was not aware that Lead 56 was involved in the accident.

Another pilot (Tanker 70, a Grumman S2) told Safety Board investigators that after being released from the fire area he followed Tanker 19 toward Ramona Airport. He said that he and several tankers, including Tanker 19, had been orbiting the area at 6,000 feet mean sea level (msl). When Lead 55's pilot released the tankers, he followed Tanker 19 to the airport and immediately began a shallow descent direct to Ramona Airport; he was flying at 180 knots indicated airspeed.

He said that he heard Tanker 19 make two transmissions over the CTAF. The first transmission was when the flight was 8 miles east of the airport and the second when the flight was on initial approach, about 2 miles east of the airport. He said that when Tanker 19 made the second call he (Tanker 70) was descending through 2,500 msl (about 1,200 feet above the ground). Tanker 19 was ahead of him flying at 180 knots and began to "slow down" and was slightly below the horizon.

He said he heard Lead 56 make a radio transmission over the CTAF, but could not recall what was said and until the collision, he did not see Lead 56. Shortly after Tanker 19 made the last transmission, he saw Tanker 19's tail (empennage) separate. Tanker 19 immediately pitched down and entered an uncontrolled descent until colliding with the terrain.

A California Department of Forestry air attack officer, a nonflying crewmember on a Rockwell OV-10, N401DF (Air Attack 310), told Safety Board investigators that helicopter fire operations continued over the fire area after the air tankers returned to the airport. He said that he was monitoring all frequencies; four FM tactical frequencies and two VHF frequencies, 122.925 MHz (air attack frequency) and 123.975 MHz (helicopter's fire operations frequency), while flying over the fire area. He heard Lead 56 transmit twice on one of the VHF frequencies. The initial transmission was when Lead 56 was departing the fire area and the second transmission was when Lead 56 reported that he was 10 miles east of Ramona Airport for landing. The air attack officer was not monitoring the airport's CTAF.

Safety Board investigators interviewed several ground witnesses. The consensus of the ground witnesses was that Lead 56 was trailing Tanker 19 from above and to the left. Lead 56 appeared to then accelerate during the descent and strike Tanker 19's vertical stabilizer. Both airplanes' empennages separated and the airplanes entered an uncontrolled descent until impact. Tanker 19 descended in a nose-down attitude and Lead 56 was in a flat spin.

A general aviation pilot departing the area and a tanker pilot taxiing to the tanker base said

that they heard both airplanes transmit their position over the CTAF.

Some of the witnesses said that both airplanes executed the 360-degree overhead approach before the collision, and that both airplanes' landing gears were retracted.

The approximate collision coordinates are: 33 degrees, 02.14 minutes north latitude and 116 degrees, 53.19 minutes west longitude.

Crew Information

N4989P (Tanker 19)

Pilot-in-Command (PIC)

The PIC was employed by Aero Union Corporation (herein referred to as Aero Union) since 1984. He held a commercial pilot certificate with airplane single and multiengine land, instrument airplane, and DC-4, L-P2V, and L-188 type ratings. He also held an unrestricted second-class medical certificate that was issued by a designated Federal Aviation Administration (FAA) medical examiner on April 5, 1995.

The operator provided the Safety Board with both pilots' flight records that included excerpts from their personal flight hours logbook. The flight hours reflected on page 3 of this report were derived from examination of these records, and the pilot's Forest Service Airplane Pilot Qualification and Approved Record dated April 10, 1995.

The examination revealed that the captain had accrued a total of 6,100 hours, including 5,400 hours as PIC. He had also flown 750 hours as PIC in the accident airplane make and model. During the 60 days preceding the accident, the pilot accrued more than 10 hours in the accident airplane make and model. During the preceding 24 hours of the accident, the PIC and the Second-in-Command (SIC) had flown 4 hours.

The pilot satisfactorily completed a PIC proficiency check under the provisions of 14 CFR 61.58, an instrument competency check as required by 14 CFR 61.57, and demonstrated the skill and knowledge requirements as required by 14 CFR Part 137.19 on April 13, 1995.

In addition to the certificates noted above, the PIC held an expired flight instructor certificate with airplane single engine and instrument airplane ratings. He also held an aircraft mechanic certificate with airframe and powerplant ratings.

Second-in-Command (SIC)

The SIC was employed by Aero Union on May 29, 1995. She held an airline transport pilot (ATP) certificate with an airplane multiengine land rating. She received the ATP certificate on April 9, 1995. The certificate was endorsed for commercial privileges with an airplane single engine land rating. She also held an unrestricted first-class medical certificate that was issued by a designated FAA medical examiner on December 1, 1994.

The flight hours reflected in Supplement E of this report were derived from the company's records and the Forest Service Airplane Pilot Qualification and Approved Record dated May 30, 1995. The examination revealed that the first officer accrued 2,142 hours, of which 2,064 hours were flown as PIC. During the preceding 90 days of the accident, the SIC accrued 135 hours that included 6 hours as SIC in the accident airplane make and model.

The SIC satisfactorily completed a SIC proficiency check under the provisions of 14 CFR 61.55, and demonstrated the skill and knowledge requirements as required by 14 CFR Part 137.19 on

April 30, 1995.

Aero Union's Chief Pilot noted in the SIC's training records that he did not observe any problems during the training and [that she had] nice awareness at all times.

In addition to the certificates noted above, the SIC held a flight instructor certificate with airplane single engine and instrument airplane ratings. She also held a flight engineer certificate with a turbojet powered rating, and an aircraft mechanic certificate with airframe and powerplant ratings.

N156Z (Lead 56)

The pilot was employed by the Forest Service. He held an airline transport pilot certificate with an airplane multiengine land rating; the certificate was endorsed for commercial privileges with an airplane single engine land rating. He also held an unrestricted first-class medical certificate that was issued by an FAA designated airman medical examiner on January 17, 1995.

Safety Board investigators recovered the pilot's flight hours logbook. The flight hours reflected in this report (LAX-95-F-A219B) were derived from the pilot's logbook and the Pilot/Operator Aircraft Accident Report, NTSB 6120.1/2, submitted by the Forest Service and include the accident flight. The logbook and aircraft accident report disclosed that the pilot accrued 5,494 hours, of which 505 hours were in the accident airplane make and model. During the preceding 90 days of the accident, the pilot logged 97 hours in the accident airplane make and model. He also flew 13.8 hours during the preceding 24 hours of the accident.

The pilot satisfactorily completed the airline transport pilot flight test on February 2, 1995. The flight test satisfied the biennial flight review requirements of 14 CFR 61.56.

In addition to the pilot certificates noted above, the pilot held a flight instructor certificate with airplane single engine, multiengine, and instrument airplane ratings.

Aircraft Information

N4989P

The airplane was registered to and operated by Aero Union and was operating under contract to the Forest Service. The U.S. Forest Service exercised operational control of the airplane during its fire suppression operations.

The airplane was originally operated by the U.S. Air Force. The FAA issued the airplane a multiple airworthiness certificate pursuant to the provisions of 14 CFR 21.187, a standard airworthiness certificate in the transport category on April 12, 1984, and a special airworthiness certificate in the restricted category on October 17, 1984. The operating limitations specify, in part:

. . . no person may operate this aircraft for other than that the purpose for which the special airworthiness certificate was issued [Forest and Wildlife Conservation] and in accordance with operating limitation contained in FAR 91.313 with special operating limitations to operate over densely populated areas, in congested airways, from busy airports where passenger transport operations are being conducted and those contained herein. . .

Aero Union maintained the airplane under 14 CFR 91.409(F)4; a continuous airworthiness program. The airplane flight hours and maintenance data reflected in this report were obtained from the operator's Pilot/Operator Aircraft Accident Report, NTSB Form 6120.1/2.

According to the report, the airplane and engines were last inspected on May 1, 1995. The airplane accrued 10 flight hours since the inspection and 23,507 total hours at the time of the accident.

N156Z

The airplane is registered to and maintained by the U.S. Department of Agriculture Forest Service. Examination of the airplane's maintenance records disclosed that the airplane is maintained according to the manufacturer's inspection program that consists of six phases.

Beechcraft West, Ontario International Airport, conducted the last inspection, a phase 4 inspection, on June 15, 1995. At the time of the accident, the airplane accrued 9.7 hours since the inspection. There were no deferred maintenance discrepancies that would have affected the airplane's performance.

Meteorological Information

Ramona Airport does not have an official weather observation facility. The weather data reflected on page 4 of this report were obtained from the pilot and ground witnesses. According to the witnesses, visual meteorological conditions existed at the time of the accident and the surface and airborne visibility exceeded 20 miles.

According to a Safety Board computer generated Sun and Moon position program, at the time and position of the collision the sun was 66.6 degrees above the horizon on a bearing of 091.8 degrees.

Airport Information

Ramona Airport is operated by the County of San Diego, San Diego, California. The airport is located 2 miles east of the city. It has one 4,000-foot-long by 150 feet wide asphalt surfaced runway. The runway is oriented in an east/west direction (9/27). The field elevation is 1,393 feet msl.

The airport manager told Safety Board investigators that she was aware that air tankers sometimes execute a 360-degree overhead approach. She said that she did not specifically approve this maneuver; nor did she disapprove it.

Forest Service personnel reported that all air tankers use a 360-degree overhead maneuver when flying inbound from the east and landing on runway 27. The airplanes are to fly parallel and to the right (north) of the runway and initiate the crosswind leg over the departure end of the runway. The airplane would then continue to make left 90-degree turns until established on final approach.

The check airman aboard Lead 55 said that at a prefire season briefing, he told all pilots that the overhead maneuver would be flown at 2,000 feet above the ground. The pilot flying Tanker 70 and a CDF OV-2 (a Cessna 337) pilot said that the pilots fly the overhead approach at the established traffic pattern altitude of an airport. This altitude is usually 1,000 feet above the airport field elevation.

Neither of the pilots aboard Tanker 19 attended the prefire season briefing; nor were they required to.

The Forest Service said that air tankers have flown out of Ramona Airport since 1957, and have always used the 360-degree overhead maneuver when approaching from the east. This

procedure is also used at some, but not all, noncontrolled airports. The Forest Service does not have any written documentation that specifies the parameters, that is, the altitude for the initial approach, when to use the maneuver, and the initial approach airspeed.

Aero Union's Chief Pilot said that the initial approach to the airport is usually flown at 180 knots indicated airspeed until the airplane is about 1 mile from the threshold. At this time, the pilot would slow the airplane to less than 150 knots to extend the flaps to the approach position.

Forest Service pilots told Safety Board investigators that the Beech BE-58 airplanes are usually flown at 180 knots IAS until the pilot initiates the break. During the break maneuver, the pilot would begin extending the flaps and landing gears when the appropriate airspeed(s) are obtained.

Safety Board investigators observed air tankers executing the 360-degree overhead approach during landings on runway 27. The altitudes appeared to vary between 1,000 and 1,500 feet above ground level. The initial approach course was flown directly over the city.

The airport data sheet requires all aircraft to execute left turns for either runway 9 or 27 at 2,400 feet msl. The traffic pattern plan view shows a 45-degree entry leg onto the downwind leg for either runway.

Title 14 CFR 91.127, states, in part:

Each person operating an aircraft to or from an airport without an operating control tower shall-

(1) In the case of an airplane approaching to land, make all turns of that airplane to the left unless the airport displays approved light signals or visual markings indicating that turns should be made to the right, in which case the pilot shall make all turns to the right.

Title 14 CFR 137.45, Nonobservance of Airport Traffic Pattern, states, in part:

Notwithstanding Part 91 of this chapter, the pilot in command of an aircraft may deviate from an airport traffic pattern when authorized by the control tower concerned. At an airport without a functioning control tower, the pilot in command may deviate from the traffic pattern if-

(a) Prior coordination is made with the airport management concerned;

(b) Deviations are limited to the agricultural aircraft operation.

The Forest Service personnel policy letter states, in part, "Pilots of arriving aircraft should monitor the designated CTAF when the aircraft is 10 miles from the airport and establish and maintain communications until landing."

Fire

The USDA Forest Service Engine Crew initially responded to the ground fire area. The Ramona City Fire Department and the California Department of Forestry responded to the accident site. The initial fire personnel (Forest Service) arrived at the accident site at 1114 hours. Fire personnel reported that they did not experience any abnormal difficulties in their fire suppression activities and contained the fire about 1233 hours.

Wreckage and Impact Information

Both airplanes' main fuselages came to rest at 344 N. Letton Street, Ramona, California. The main wreckage area is about 1 mile east of the runway 27 threshold and about 475 feet north of the extended center line.

N4989P (Tanker 19):

Ground scars and the wreckage examination revealed the airplane struck the ground in a nose-down attitude, about 20 degrees beyond the vertical plane toward an inverted position. The fuselage and wings sustained extreme impact and postimpact fire damage; the cockpit area was incinerated.

All of the airplane's major components, except the empennage, were found at the main wreckage area. Both wings separated from their respective wing-to-fuselage attach fittings.

Left Wing:

The left wing was found lying inverted with the inboard section pointing toward the north, away from the cockpit area. The left wing flap remained attached to the wing and was found extended about 12 degrees. The inboard and outboard flap actuators remained attached at their respective attach fittings and were found extended 4 1/2 inches and 8 inches, respectively (the actuators are different sizes). According to Aero Union Corporation maintenance personnel, these extensions are consistent with the flaps being at the takeoff/approach setting.

Right Wing:

The right wing was found disintegrated and unrecognizable, except for the section aft of the number 3 engine.

Landing Gears:

The left main landing gear was found stowed in its wheel well and the aft gear doors were closed.

The right main landing gear separated from its respective attach fittings and exhibited extensive impact damage. The landing gear actuator was found fully retracted and its end-cap attachment was broken.

The nose landing gear separated from its respective attach points and were found next to the cockpit structure. The uplock mechanism was broken. According to Aero Union Corporation maintenance personnel, this mechanism could only be broken if the nose landing gear was in the up position at impact.

Cockpit Area:

The cockpit area sustained extreme impact damage and was found lying inverted next to the water tank. Most of the instruments, except for the flap indicator, were destroyed. The flap indicator showed a 12-degree flap extension.

The landing gear handle was found in the neutral position that corresponded to the neutral position of the landing gear selector valve. The controlling linkage to the selector valve was broken.

Cargo Compartment:

The main cargo compartment was found about 15 feet southeast of the cockpit area. The structure was found collapsed from the left to the right (viewing from the rear to the front).

The forward section of the dorsal fin was found crushed and folded to the right.

Empennage:

The empennage separated at impact and came to rest, inverted, in the back yard at 118 N. Letton Street, about 135 feet south of the runway 27 extended center line.

The empennage forward bulkhead displayed clockwise (viewing from the rear toward the front) torsional overload signatures. The right side exhibited extensive buckling signatures.

The right horizontal stabilizer outboard panel was impaled by a wood post. The right horizontal stabilizer leading edge did not display any ground impact damage, but had black rub marks and a leading edge compression buckled area.

The left horizontal stabilizer leading edge exhibited extensive ground impact signatures. The outboard panel was crushed rearward.

The vertical stabilizer forward spar separated about 4 feet above its base. The right vertical stabilizer skin displayed extensive accordioning and was found bent to the right.

The midsection of the vertical stabilizer and rudder were found behind the empennage. The upper sections of the vertical stabilizer and rudder were found at 145 N. Letton Street; the midsection piece of the vertical stabilizer was found at 131 N. Letton Street.

The upper section of the vertical stabilizer displayed two slash marks on the forward left side of the vertical stabilizer. The slash marks were about 5.125 inches apart and began about 7 inches from the top of the vertical stabilizer.

Safety Board investigators matched the vertical stabilizer scratch marks with N156Z's right elevator counterweight and its horizontal stabilizer leading edge tip. These components matched the scratch marks when the elevator was placed in the full up position.

The rear upper section of the vertical stabilizer that contained the rotating beacon was found crushed and bent to the right. The scratch marks were found oriented about 25 degrees to the left of the rudder trailing edge.

Engines/Propellers:

All four engines separated from their respective firewall attach points. The engines sustained extreme impact and postimpact fire damage.

The number 1 propeller assembly was found attached at its engine crankshaft. One blade was bent toward the camber side; the remaining two blades were sheared at midspan.

The number 2 propeller assembly separated from its engine crankshaft. One blade was sheared at the hub; the other blade was bent toward the camber side; and the remaining blade displayed slight bending toward the face side and contained a gouged area about 6 inches from the tip.

The number 3 propeller assembly separated from its engine crankshaft. Two of the blades melted and the remaining blade was bent toward the face side.

The number 4 propeller assembly separated from its engine crankshaft. All of the blades were melted.

N156Z

The airplane came to rest, inverted, facing toward the west. The airplane sustained major fire and impact damage. All of the airplane's major components and flight control surfaces, except the empennage, were found at the main wreckage area. The empennage was found in an open field about 1 mile southeast of the main wreckage area.

Fuselage:

The fuselage sustained postimpact fire damage that consumed the fuselage from the cockpit aft to the pressure bulkhead. The left side of the fuselage exhibited scratches parallel to the aircraft's vertical axis that began at the radar dome and continued aft to the leading edge of the left wing. The middle of the nose section exhibited two scratches that began at the left nose landing gear door and continued along the vertical axis of the aircraft for about 2 feet.

Cockpit Examination:

The fuel selector handles were found with the left handle at the MAIN position and the right handle at the CROSSFEED position. The corresponding selector valves, however, were found with the left valve in the MAIN position and the right valve in the OFF position. The fuel selector valves are located in the wing with the selector handles in the cockpit.

Beech Aircraft Corporation engineers reported, in part:

The fuel selector system is designed such that if the actuator and the valve are pulled in opposing directions, the handle and valve would rotate in opposite directions, that is, the handle would rotate toward the CROSSFEED position and the valve would rotate toward the OFF position. This corresponds to the right fuel selector in the referenced accident. The right selector handle was in the CROSSFEED position, at which point it would not move any further.

Left Wing:

Both wings remained attached at their respective wing-to-fuselage attach fittings and sustained postimpact fire damage around the area that contained the fuel tanks.

The left wing main spar web sustained postimpact fire damage except for the outboard 1/3 of the wing span. The inboard section of the spar was bent down. The rear spar was totally consumed by postimpact fire except for the outboard 1/3 of the wing span. About 3 feet of the wing tip separated from the wing during the impact. The tip section was not located.

The aileron trim actuator measured 1.0 inches extended, which corresponds to 9.25 trim setting. The aileron remained attached to the wing with the inboard edge being consumed by the postimpact fire.

The flap was located at 1930 Robertson, approximately 1/4-mile from the main wreckage. The flap exhibited contact damage on the inboard section of the lower surface.

Right Wing:

The main spar web sustained postimpact fire damage except for the outboard 1/3 of the wing span. The rear spar was totally consumed by postimpact fire except for the outboard 1/3 of the wing span. The aileron was totally consumed by postimpact fire.

The flap was totally consumed by the post impact fire. The flap actuator measured 1.75 inches extended, which corresponds to the flaps being in the retracted position.

Flight Controls:

The aileron control cables were intact from the cockpit control column to the melted aileron bellcranks. Only one elevator cable was attached from the cockpit control column to the elevator bellcrank. The other elevator control cable, both rudder cables, and the elevator and rudder trim cables had separated at the empennage. The ends of these cables were attached to the cockpit control.

Empennage:

The empennage separated from the fuselage just forward of the vertical stabilizer during the collision. The empennage fracture surfaces exhibited left torsional twisting; the airplane fracture surfaces displayed right torsional twisting.

The rudder and elevator cables cut into the bulkheads during separation. The elevator bellcrank broke into two sections with the lower section remaining attached to the empennage and the upper section with the fuselage. The rudder cables displayed tension overload characteristics.

The elevator trim actuator was found extended 0.75 inches; this extension corresponds to a trim 10 degrees tab up (nose down) setting. The elevator trim cables displayed tension overload characteristics. The maximum travel of the elevator trim is 25 degrees.

The rudder trim actuator was found extended 3.0 inches; this extension corresponds to a trim setting of 25 degrees tab right (nose left). The cables to the rudder trim system had separated in tension overload during the separation of the empennage. The maximum travel of the rudder trim tab is 25 degrees.

Left Engine and Propeller:

Safety Board investigators established continuity of both engines' gear and valve train assemblies. The accessories were destroyed by the postimpact fire and could not be tested.

The left engine sustained impact damage to the top of the cylinders. The area surrounding the turbocharger was charred by postimpact fire. The turbocharger impeller was seized and could not be rotated.

The upper spark plugs were wet with oil and bent from impact, and exhibited normal operating signatures. No abnormal center electrode ovaling or abnormal combustion signatures were observed.

The propeller separated from the engine. The crankshaft exhibited a torsional fracture. The first propeller blade was bent toward the face side, about 30 degrees from its normal position. The blade was found in the feathered position. The second propeller blade was undamaged and exhibited cable chattering marks on the camber side leading edge. The third propeller blade was bent about 30 degrees forward, and was also in the feathered position. The propeller was found next to the engine resting on its first and third blades.

Right Engine and Propeller:

The right engine sustained impact damage to the top of the cylinders. The area surrounding the turbocharger sustained postimpact fire and its impeller was seized.

The spark plugs were wet with oil and bent from impact, and exhibited normal operating signatures. No abnormal center electrode ovaling or abnormal combustion signatures were observed.

The propeller remained attached to the engine. All of the propeller blades were found in the feathered position. The first propeller blade was undamaged. The second propeller blade was bent about 120 degrees toward the face side and exhibited a slight twist toward low pitch. The third propeller blade broke off about 3 inches from the hub and was bent about 90 degrees toward the face side.

Tests and Research

Lead 56 Communication/Navigation Radios

The Safety Board sent Lead 56's numbers 1 and 2 communication and navigation radios (KX-165, serial numbers 48630 and 48642, respectively) and audio panel (KMA-24H) to the manufacturer, Allied Signal General Aviation Avionics, Kansas City, Kansas, for examination.

The KX-165 communication/navigation radios are equipped with two display windows for the communications frequencies and navigation frequencies, respectively. The radios have an active and standby display for the communication frequencies and an active and standby display for the navigation frequencies.

On July 12, 1995, the manufacturer examined the units under the supervision of an FAA inspector from the Kansas City Manufacturing Inspection District Office. The external examination revealed that the communication/navigation radios and audio panel could not be functionally tested due to severe impact and postimpact fire damage.

The engineers, however, removed the EAROM (Electrically Alterable Read Only Memory - a computer chip) from each of the communication and navigation radios and installed them in another test radio. The EPROM contains the nonvolatile memory chip, and the engineers were able to determine the frequencies that were set for each communication and navigation radio.

The following table shows the frequencies displayed for each radio:

| | | | | |
|---------------|------------------|-------------------|---------------------|-----------|
| Radio | Active Frequency | Standby Frequency | No. 1 Communication | 123.975 |
| MHz | 122.7 MHz | No. 1 Navigation | 114.0 MHz | 112.2 MHz |
| Communication | 122.7 MHz | 122.925 MHz | No. 2 Navigation | 114.0 Mhz |
| | | | | 112.2 MHz |

The engineers reported that the audio panel microphone selector switch was found set to the number 2 communications radio and all the audio switches were pushed in (active).

Propellers Examination:

Both propellers were examined at Santa Monica Propeller, Inc., Santa Monica, California, on August 8, 1995.

Both propeller assemblies' blades were found in the feathered position. The left propeller separated from its respective crankshaft attach point; the fracture surface displayed extensive torsional overload signatures. The left propeller blades were intact.

The right propeller assembly was found attached at its respective attach point. Two of the right propeller blades were intact; the remaining blade separated at the hub assembly.

Disassembly examination disclosed both pitch change rods (oil tubes) were found broken about 3.875 inches aft of the piston assembly. According to a Santa Monica Propeller technician, this condition would deplete the oil pressure and the counterweights and feathering spring tension would drive the propeller blades into the feather position.

Left Propeller:

The number 1 propeller blade butt displayed a burnish mark near the pitch control knob feather position; the remaining two blades butts did not display any burnish or impact marks. All of the blade pitch control knobs were intact.

Two of the three propeller blades displayed leading edge gouging and extensive cable chattering marks. The face side of the blades displayed extensive spanwise score marks.

Right Propeller:

The number 1 pitch control knob was found bent and its associated block was broken.

The pitch change rod was found bent at the pitch change fork assembly. The number 1 pitch knob was found bent downward; the remaining two pitch knobs were found bent upward.

The preload plates displayed impact marks. The adjacent pitch change fork ends displayed similar impact signatures.

Hartzell Propeller, Inc. Report:

Hartzell Propeller, Inc., was unable to send any representatives to assist in the propeller disassembly examination. An engineer reported that he examined Safety Board investigators photographs of the disassembled propellers blades.

Right Propeller:

He said that the numbers 1 and 2 right propeller preload plates clearly show impact markings from the propeller fork. These marks place the propeller blades in the low blade regime (high RPM) of the propeller's normal operating range. The impact marks on the number 3 preload plate can not be specifically identified to the propeller fork, however, the location is consistent with the above.

Left Propeller:

The photographs show only one preload plate blade side rather than the "hub side" of a blade bearing serial number F25147. He said that the three photographs of the blade:

. . . show a circular contour indent on the OD [outside diameter] of the blade butt end. This contour is located roughly between the "P20" inspection stamp and the "F" from the blade serial number, both stamped on the blade butt. . .

The contour indent was most likely made from contact with the circular end of the cam lobe cut-out section (for the blade pitch change knob) of the preload plate as shown on the preload plate photo. However, the contour of the plate does not closely match the contour on the blade OD as would be expected from a mark occurring during first or early impact contact. The blade OD markings indicate that the blade was moving from a "low" toward a "high" angle direction. It does not suggest that the blade started from a "high", in this case a feather or near feather position, and moved toward a lower angle position.

Pitch Change Rods/Left Crankshaft Flange Metallurgical Findings:

The fractured pitch change rod's sections (four pieces) were examined by the National Transportation Safety Board Material Laboratory (RE-30) on September 7, 1995.

The metallurgist reported that the tubes showed characteristics of overstress on all the fracture surfaces.

The forward portion of the crankshaft containing the left propeller flange was separated transversely about 2 inches aft of the flange. Evidence of a small progressive fracture indicative of fatigue was noted emanating from the outside diameter surface. Initiation of the fatigue appeared to be from an area of numerous overstress cracks oriented on spiral planes representative of excessive torsional stress applied to the crankshaft.

Medical and Pathological Information

The San Diego (California) Coroners Office conducted the post mortem examination of all the crewmembers involved in this accident. The pathologist did not note that any crewmember had a condition or disease that would have detracted from their ability to perform their duties.

The FAA, Civil Aeromedical Institute, Oklahoma City, Oklahoma, conducted toxicological examinations on the crewmembers involved in this accident. The toxicological examinations were negative for alcohol or drugs for the pilot-in-command of both aircraft.

Tanker 19 second-in-command toxicological examinations showed the presence of salicylate [23.300 (ug/ml, ug/g)] and acetaldehyde [1.000 (mg/dl)]. According to the FAA, Western Pacific Region Flight Surgeon, salicylate and acetaldehyde are drugs normally found in aspirin. The quantities found are within the therapeutic levels and would not inhibit the performance capabilities of the pilot.

Additional Information

In addition to those persons listed on page 5 of this report, the following persons participated in this accident investigation:

Mr. Ronald E. Hale California Department of Forestry Mr. Robert M. Lunning Aero Union Corporation
 Mr. Ronald E. Stewart USDA Forest Service

Safety Board investigators released both airplanes to the USDA Forest Service on June 24, 1995. Both airplanes were at Ramona Airport when released.

Pilot Information

| | | | |
|----------------------------------|--|--|----------------------------|
| Certificate: | Commercial | Age: | 33, Male |
| Airplane Rating(s): | Multi-engine Land; Single-engine Land | Seat Occupied: | Left |
| Other Aircraft Rating(s): | | Restraint Used: | Seatbelt, Shoulder harness |
| Instrument Rating(s): | Airplane | Second Pilot Present: | Yes |
| Instructor Rating(s): | None | Toxicology Performed: | Yes |
| Medical Certification: | Class 2 Valid Medical--no waivers/lim. | Last Medical Exam: | 04/05/1995 |
| Occupational Pilot: | | Last Flight Review or Equivalent: | |
| Flight Time: | 6100 hours (Total, all aircraft), 5300 hours (Pilot In Command, all aircraft), 23 hours (Last 90 days, all aircraft), 11 hours (Last 30 days, all aircraft), 4 hours (Last 24 hours, all aircraft) | | |

Aircraft and Owner/Operator Information

| | | | |
|-------------------------------|--|------------------------------------|-----------------|
| Aircraft Manufacturer: | DOUGLAS | Registration: | N4989P |
| Model/Series: | C-54G C-54G | Aircraft Category: | Airplane |
| Year of Manufacture: | | Amateur Built: | No |
| Airworthiness Certificate: | Restricted | Serial Number: | 36082 |
| Landing Gear Type: | Retractable - Tricycle | Seats: | 3 |
| Date/Type of Last Inspection: | 05/01/1995, AAIP | Certified Max Gross Wt.: | 71800 lbs |
| Time Since Last Inspection: | 10 Hours | Engines: | 4 Reciprocating |
| Airframe Total Time: | 23507 Hours | Engine Manufacturer: | P&W |
| ELT: | Installed, activated, did not aid in locating accident | Engine Model/Series: | R-2000-3 |
| Registered Owner: | | Rated Power: | 1450 hp |
| Operator: | | Air Carrier Operating Certificate: | |

Meteorological Information and Flight Plan

| | | | |
|----------------------------------|-------------------|-------------------------------|----------|
| Conditions at Accident Site: | Visual Conditions | Condition of Light: | Day |
| Observation Facility, Elevation: | , 0 ft msl | Observation Time: | 0000 |
| Distance from Accident Site: | 0 Nautical Miles | Direction from Accident Site: | 0° |
| Lowest Cloud Condition: | Clear / 0 ft agl | Temperature/Dew Point: | 80° C |
| Lowest Ceiling: | None / 0 ft agl | Visibility | 20 Miles |
| Wind Speed/Gusts, Direction: | 10 knots, 270° | Visibility (RVR): | 0 ft |
| Altimeter Setting: | | Visibility (RVV): | 0 Miles |
| Precipitation and Obscuration: | | | |
| Departure Point: | HEMET, CA (HMT) | Type of Flight Plan Filed: | None |
| Destination: | (L39) | Type of Clearance: | None |
| Departure Time: | 1022 PDT | Type of Airspace: | Class G |

Airport Information

| | | | |
|----------------------|------------------|---------------------------|-----------------|
| Airport: | RAMONA (L39) | Runway Surface Type: | Asphalt |
| Airport Elevation: | 1393 ft | Runway Surface Condition: | Dry |
| Runway Used: | 27 | IFR Approach: | None |
| Runway Length/Width: | 4000 ft / 150 ft | VFR Approach/Landing: | Traffic Pattern |

Wreckage and Impact Information

| | | | |
|---------------------|---------|----------------------|-----------|
| Crew Injuries: | 2 Fatal | Aircraft Damage: | Destroyed |
| Passenger Injuries: | N/A | Aircraft Fire: | On-Ground |
| Ground Injuries: | N/A | Aircraft Explosion: | On-Ground |
| Total Injuries: | 2 Fatal | Latitude, Longitude: | |

Administrative Information

Investigator In Charge (IIC): A. D LLORENTE **Adopted Date:** 06/25/1996

Additional Participating Persons: JOHN L WHITE; SAN DIEGO, CA
TYRONE PARK; SAN DIEGO, CA
JAMES STERMER; WICHITA, KS
ASHER A WILLIAMS; OGDEN, UT

Publish Date:

Investigation Docket: NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at pubinq@ntsb.gov, or at 800-877-6799. Dockets released after this date are available at <http://dms.nts.gov/pubdms/>.

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