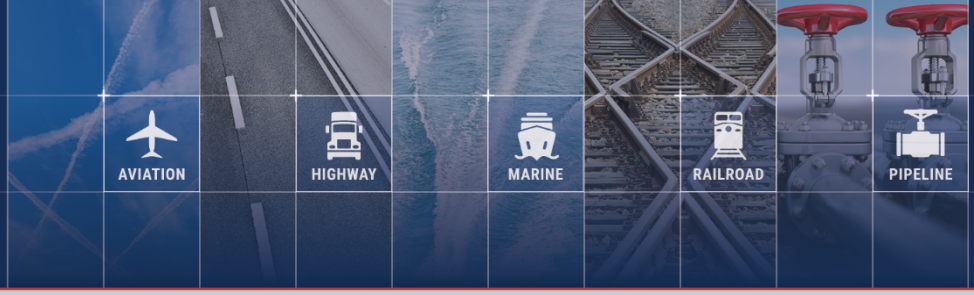


# Aviation Investigation Factual Report

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| **Location:** | El Cajon, California | **Accident Number:** | LAX02FA157 |
| **Date & Time:** | May 11, 2002, 12:42 Local | **Registration:** | N2948H |
| **Aircraft:** | Ercoupe (Eng & Research Corp.) 415C | **Aircraft Damage:** | Destroyed |
| **Defining Event:** | | **Injuries:** | 1 Serious |
| **Flight Conducted Under:** | Part 91: General aviation - Flight test | | |

## Factual Information

### 1.1 HISTORY OF FLIGHT

On May 11, 2002, at 1242 Pacific daylight time, a Ercoupe (Engineering & Research Corp.) 415C, N2948H, collided with obstacles and the ground on a freeway in El Cajon, California, during an attempted forced landing following a loss of engine power. No automobiles were involved on the ground. The airplane was owned and operated by the pilot under the provisions of 14 CFR Part 91 of the Federal Aviation Regulations. The airplane was destroyed in the collision sequence. The private pilot, the sole occupant, sustained serious injuries. Visual meteorological conditions prevailed at the time and no flight plan had been filed. The local area post maintenance test flight originated at the Gillespie Field airport, El Cajon, at 1140.

According to controllers at the Federal Aviation Administration (FAA) Air Traffic Control Tower at Gillespie Field, when the pilot departed he informed them that he would be breaking in a new engine and would be orbiting northeast of the airport. About 1240, the pilot radioed the local controller and declared an emergency, noting that he had a rough-running engine. At the time he stated his position as 5 miles east of the airport. The local controller cleared the pilot to land on runway 27R. Shortly after that, the pilot stated "mayday mayday." The controller stated that he saw the airplane on final approach and it "nose dived" out of his sight.

The airplane collided with the eastern most fence bordering the freeway right of way, then the ground in the northbound lanes of highway 67 about 1/2 mile from the approach end of runway 27R. The airplane came to rest inverted on the freeway.

A post accident investigation disclosed that the recently overhauled engine had just been installed in the airframe and this was the first flight following this maintenance activity. The mechanic who installed the engine was initially interviewed on site by a responding FAA inspector. During the interview, he provided the airframe and engine maintenance records to investigators. He stated that the Teledyne Continental C-75 engine had been overhauled and he completed the reinstallation that morning. Following installation, he performed a 20-minute ground run of the engine. A fuel leak was noted in a fitting in the line to the carburetor and that was tightened. There were no other discrepancies noted in the engine indications. The pilot then took the airplane for a post maintenance test flight and engine break-in. The mechanic noted that the carburetor was overhauled at the same time as the engine.

### 1.1 Pilot's Statement

The pilot, who is also the owner of the airplane, was interviewed at his residence following release from the hospital. He said that he did not participate in any of the maintenance

activities associated with the removal or installation of the engine. The mechanic who installed the engine is the one who does all of the maintenance on the airplane and has a key to the hangar where the airplane is kept.

He noted that it was in late November 2001 that he first became aware of a low oil pressure and a high oil temperature condition. This first manifested itself during a video taping flight over the southern San Diego area. The readings were of such concern that he diverted the flight to Brown Field and landed. The mechanic was contacted by telephone and he came out to troubleshoot the problem. Over a week-long period the mechanic attempted to resolve the problem without success. Eventually he determined that it was safe to move the airplane back to Gillispie Field. The pilot stated that the mechanic telephoned an engine overhaul shop, Barkhorn Precision Engines, and the resulting recommendation was for an overhaul, which the pilot agreed to. He denied that he instructed the mechanic to do only a "bottom end overhaul."

He could not recall the date of the last fueling on the airplane, however, he acknowledged that it could have been in early December.

While he is unsure of the dates, he believes that the engine was removed in the early December time frame for the overhaul. The overhaul seemed to take a long time and they were anxious to have their airplane back, but he did not pressure the mechanic to get the airplane back quickly. He was advised when the engine was delivered on May 6, and then the mechanic telephoned on May 10 and said the airplane would be ready the next day. The pilot arrived at the airport after the mechanic had performed the ground run of the engine. He was not present during any of the final installation or test run processes.

The mechanic told him that the airplane was ready for a test flight and that he should take it up for about an hour, changing the rpm setting every 5 minutes. The pilot said he did a preflight inspection, which included sump checking the fuel tanks. As for determination of quantity, the fuel gage in the cockpit read 3/4ths and the sight gage on the header tank was showing about 6 gallons. He explained that the one fuel gage combines the readings for both wing tanks. He interpreted the readings to mean that he had 6 gallons in each of the wing tanks and 6 gallons in the header tank, for a total of about 18 gallons. On the subject of the fuel tanks, he said that he was under the impression that the mechanic removed the header tank during the engine removal process.

After the preflight, he started the engine and taxied down to the runway where he did his normal run-up process, which included two separated magneto checks. He was number 5 for takeoff and was on the ground for about 10 minutes until he received his takeoff clearance. After takeoff he flew out about 3 miles and orbited while varying the rpm every 5 minutes. During the entire flight from engine start, the power plant performed perfectly with no abnormal engine indications. At the end of 1 hour, he reported to the Gillispie Field control tower that he was ready to land and turned inbound toward the runway. On final approach, the engine just quit without any precipitating roughness or engine spool down. He said it was "like someone just turned off the key." He did not have enough altitude to make the runway and did

not want to take the chance of injuring someone on the ground by landing in a residential area or on the freeway. He selected a Christmas tree farm and set up to land there; however, he was slightly high and decided to "pancake it into the trees." After the airplane hit, it bounced back into the air and hit a fence. He does not remember anything after that.

## 1.2 PERSONNEL INFORMATION

Review of the records maintained by the FAA in the airman and medical records section disclosed that the pilot held a private pilot certificate with category ratings for airplanes single engine land and gliders. The most recent third-class medical certificate was issued on November 2, 2001, and contained the limitation that correcting lenses be worn for near vision.

The pilot supplied his most recent personal flight record logbook for review by investigators. The numeral 3 was written on the outside cover. The book encompasses entries from February 1992 to December 2001. (Note that the engine overhaul began in January 2002 and was completed on May 2, and that this was the first flight since December).

The estimated total time is 750 hours, with 70 at night. No determination could be made as to the total time in the airplane; however, all flights listed in this book were in the accident airplane. The pattern of activity averages about 5 hours per month over the course of the logbook entries, with the typical flight lasting around 0.5-hours.

A Biennial Flight Review endorsement was dated August 8, 2000, and was completed in the accident airplane.

## 1.3 AIRCRAFT INFORMATION

### 1.3.1 General Information

Review of FAA Aircraft Registry files disclosed that the airframe, an Ercoupe 415C, serial number 3573, was manufactured in 1946. A Continental C75-12 engine, serial number 3796-6-12, was installed in the airframe.

The fuel system in the airplane consists of a 6-gallon tank in each wing and a 6-gallon header tank, which is mounted in front of the cockpit. Fuel is supplied to the engine's carburetor via gravity fed line only from the header tank. The engine driven fuel pump moves fuel from the wing tanks to the header tank to replenish that supply as the engine uses it. According to the Teledyne Continental operating manual for the "C" series engines, the typical cruise fuel consumption rate of the C75 engine is between 5 and 6 gallons per hour.

Review of the fueling records at the Gillespie Field airport disclosed that the last documented fueling of the airplane occurred on December 7, 2002, with the addition of 10.0 gallons of 100LL aviation gasoline.

### 1.3.2 Airframe Logbook

This record begins with an entry dated January 3, 1972, with a notation that the annual inspection date was taken from "FAA Form 8320-3". A total airframe time was "estimated" at 1,407 hours, with a new recording tachometer reading of zero hours. At the accident site, the recording tachometer displayed 550.11 hours.

The most recent annual inspection was entered and dated May 11, 2002, with a recording tachometer time of 549.16. This entry was not signed by the completing mechanic/IA. In a subsequent interview with investigators, the completing mechanic/IA said that he wanted to wait until after the test flight to sign the return to service endorsement.

The annual inspection prior to this one was dated May 13, 2001, at a recording tachometer time of 538 hours.

### 1.3.3 Engine Logbook

As with the airframe record, the engine book begins in January 1972 with the same entry, citing FAA Form 8320-3 as the source for the total time. The estimated total time since new is the same as was listed for the airframe, 1,407 hours.

A "top" overhaul was listed on October 23, 1998, at a tachometer time of 451.1 hours. Between the "top" overhaul and the overhaul just prior to the accident, the entries document routine oil changes, with no other major work listed.

The last entry was dated May 11, 2002, and notes the engine's reinstallation in the airframe by the mechanic who performed the annual inspection. The entry states that Barkhorn Precision Engines overhauled the engine. As with the airframe annual inspection entry, this entry has the name and certificate number of the mechanic; however, it is not signed.

### 1.3.4 Mechanic and IA Interviews

The mechanic was initially interviewed by telephone on the day of the accident and was subsequently interviewed in person during the investigation.

During the initial telephone interview, he stated that he is a mechanic at Golden State Flying Club at Gillespie Field, and that he installed the engine in the airplane after it had been overhauled by a local San Diego area engine shop, Barkhorn Precision Engines. He completed the reinstallation that morning. Following installation, he performed a 20-minute ground run of the engine. A fuel leak was noted in a fitting in the line to the carburetor and that was tightened. There were no other discrepancies noted in the engine indications and he completed the logbook entries releasing the airplane for a test flight. The pilot then took the airplane for a post-maintenance test flight and engine break-in. The mechanic noted that the carburetor was overhauled at the same time as the engine, he believed by the firm El Rio

Carburetors.

The mechanic was interviewed in person at the facilities of Golden State Flying Club.

He stated that he has been an aircraft mechanic since 1946, when he first entered an airframe and power plant mechanic training course. He holds an FAA airframe and power plant mechanic certificate and an Inspection Authorization, which was most recently renewed in March 2001. His work experience includes being a civilian contract mechanic for the US Air Force, two major air carriers, and in general aviation. He came to Golden State Flying Club, his current employer, in 1993. He is currently the head mechanic, with two A & P's working for him. In addition to his full time employment with Golden State, he also does maintenance and annual inspections outside of his employment for personal clients.

He recalled that the pilot telephoned him toward the end of November 200,1 and said that they had experienced a very low oil pressure/high temperature condition and had landed the airplane at Brown Field. The mechanic then went to Brown Field to attempt to remedy the situation. He worked on the airplane for the next 5 days at Brown Field and could not totally resolve the problem. During this process, he had telephoned the Continental factory for advice and had talked to the overhaul shop owner. Finally he was able to get the airplane to a safe enough condition to fly it back to Gillispie Field. Based on the overhaul shop owner's recommendation, he advised the pilot that an overhaul was needed.

He denied that the pilot had instructed him to do a "bottom overhaul" and denied that he gave any such instruction to the overhaul shop owner. He stated that he instructed the overhaul shop owner to "do what it takes to fix the problem." He also denied removing the header tank during the engine removal process. He simply turned off the fuel valve, effectively sealing the tank from draining. The engine was removed and taken to the overhaul shop in late December. He removed all the accessories except for the engine driven fuel pump and placed them on a bench in the pilot's hangar.

After awhile he began questioning why the engine was taking so long for the overhaul completion. He had a month-long vacation planned starting on May 11, and wanted to complete the job for the pilot. The engine finally arrived on May 6, and he began the process of installation. This was done at night after completing his day job. He reported he spent 3 to 4 hours each night on the project. He said that the lighting inside the pilot's hangar was satisfactory for the job. The engine installation went without incident and he put 5 quarts of new mineral oil in the sump from his supply at Golden State. The oil was in new manufacturer's plastic containers with unbroken seals. When the engine arrived, all the accessory holes were sealed with coverings made with duct tape. He installed all the accessories except for the engine driven fuel pump, which was already installed when the engine arrived.

The engine was test run on the ground for 20 total minutes in two sessions. After the first, he detected a fuel leak at the 90-degree fuel line elbow fitting where it enters the carburetor and

tightened it. The second ground run session was satisfactory. He checked the oil after the ground runs and noted an adequate supply in the sump and observed that the oil was a golden color. The pilot had arrived by that time. He told the pilot to fly the airplane for 1hour and vary the rpm.

He began watching the pilot do a preflight inspection. The pilot did ask him something to the effect "Is the fuel good?" He replied that it was, remarking that his meaning was that the fuel should not have deteriorated in the 5 months it sat in the tanks. The mechanic did not look in the wing tanks and had no idea what they contained. He observed about a 6-gallon reading on the header tank sight gage. About this time the pilot's wife asked him a question and he turned around to talk to her for about 3 minutes. When he looked back, the pilot was continuing the preflight inspection. He did not observe the pilot look inside the fuel tanks or do a sump check. After the pilot got in, started the engine and taxied away, he left to go back to Golden State.

He became aware of the accident just after it happened and immediately got in his truck and drove there, arriving within 5 minutes of the occurrence. He found the airplane upside down on the freeway. He saw some fuel dripping from the wing tanks and noted that it had not reached pavement edge by the time he arrived. While he could not estimate how much fuel leaked out, he said he did not believe it was very much.

In response to a question about how he ensures a quality control check on his work, he said that he always goes back over a portion of the job after completion to check for fastener tightness and that all other aspects are correct. When the discrepancies found during the wreckage exam and engine teardown were pointed out to him, the mechanic replied that he must have been tired and rushed to have missed those items. In response to additional questions about pressure to complete the job, he stated that he did feel pressure to get the job done because of his vacation plans, and the fact that the pilot had waited for 5 months to get his airplane back.

The mechanic was asked to relate his normal daily routine and especially the week during which the engine was installed. He stated that the week was not much different than any other except for perhaps spending slightly more time trying to complete the engine installation. He said he normally rises each morning at 0700 and has a bowl of cereal for breakfast. He normally arrives at Golden State by 0800 and works until 1630. He does not usually take a lunch break, but works straight through until quitting time. After leaving Golden State, he goes home and has dinner, and is back at the airport by 1730, where he spends 3 to 4 hours doing outside maintenance jobs and annual inspections for his personal clients. He typically arrives back home by 2200 and is in bed by 2300.

The mechanic was asked if he had any work orders or other notes detailing the tasks performed either during the trouble shooting process in late November, the engine removal process or the reinstallation. He replied that he did not have any records absent the logbook entries that were made covering the removal and reinstallation. He stated that he would have

made up a work order to bill the pilot, however, the accident happened and he had not had a chance to complete that sort of paper work.

1.3.5 Engine Overhaul Facility

The overhaul shop owner was interviewed was conducted at his facility. Barkhorn Precision Engines is wholly owned by the overhaul shop owner and does business as a DBA. He holds an FAA Repair Station Certificate, number YQ3R0007M, with ratings for Powerplant Class I and Limited Accessory. He has been an engine mechanic since 1956 and does all of the work himself in the shop.

Although not completely sure of the exact date, he recalls that the mechanic telephoned him before Christmas 2001 (he thinks around the 10th of the month), and said that he had just flown with the owner of N2948H and was concerned about a low oil pressure reading and temperature anomaly. In earlier conversations with the mechanic about this engine he had suggested that new baffling might be the answer to the apparent overheating problem; however, the mechanic told him that the owner did not want to spend the $1,000 or so dollars that new baffles would cost. The mechanic asked the overhaul shop owner what his recommendation was and the overhaul shop owner said he thought an overhaul was appropriate due to the age of the engine. The mechanic brought the engine to the shop a few days' later and left instructions that only the bottom end was to be done, since the cylinders had been overhauled less than 200 hours prior, and the overhaul shop owner agreed to this stipulation.

After receiving the engine, the overhaul shop owner tore it down and found that one piston in the No. 4 cylinder was out of tolerance, and was moderately scuffed. It was replaced along with new rings for that cylinder. The condition of the piston and cylinder showed heat, with piston material melted onto the cylinder wall. The cylinder was honed to specification and the cylinder assemblies were set aside. Other discrepancies concerned the crankshaft and camshaft, both of which were out of tolerance in several critical areas and had to be replaced.

The crankcase was sent out to Divco, Tulsa, Oklahoma, for a weld repair. The accessory case was sent to Drake Air, also of Tulsa. The oil cooler was sent of Positech International, Wheeling, West Virginia, for recertification. These components were shipped out to the listed firms in early January 2002. An overhauled crankshaft and camshaft were purchased from Aircraft Specialties Services, Tulsa.

The newly reworked and certified accessory case and crankcase arrived back at the overhaul shop owner's facility by the first of March, with the oil cooler received toward the end of that month or just after the first of April. The crankshaft and camshaft did not arrive until the first part of April. As was his habit, he did not open the boxes to inspect the shipments right away, preferring instead to let them stay in the protected shipping containers until he actually began to assemble the engine. During April he received a great deal of work and he did not get around to this engine until the first of May.

With regard to the oil cooler, he telephoned his contact at Positech, around the end of February when the oil cooler had not arrived. The contact said they were considering a proposal to manufacture these oil coolers because of their relative rarity and asked the overhaul shop owner if it would be alright if they kept it for a while to make some drawings. The overhaul shop owner agreed.

The overhaul shop owner began work on reassembling the engine on May 5. After unpacking the crankcase, he blew through all the oil passages and found no evidence of contamination. Similarly, the oil passages in the crankshaft were open and without contamination. When he unpacked the oil cooler, however, he noticed a white powdery substance on the plastic shipping plugs installed in the entrance/exit ports. As he examined the oil cooler further, some brownish and/or rust colored flakes came out of the ports. He shook the cooler against a table and more material came out. He contacted Positech and stated the problem. The company advised him that the cooler was most likely not preserved as well as it should have been and to flush the cooler with solvent.

The overhaul shop owner then proceeded to use the solvent, flushing it back and forth through the oil cooler. He did not use a filter to strain the solvent and check for contaminants at the end of the flush cycle. When he was satisfied that the contaminants were flushed out, he installed the oil cooler.

The remainder of the engine assembly was without difficulty or abnormality. He uses a product called "Assembly Lube" made by the Staylube company. He does not have an engine test cell and cannot perform an initial ground run after assembly. He does provide a detailed instruction sheet to the customers detailing the proper pre-oil and initial ground run procedures. This instruction sheet is based on either Continental Service instruction MA89-7 (rev 1) or Lycoming Service Instruction SI1427B.

He delivered the engine to the mechanic at the pilot's hangar. The engine was without spark plugs or accessories when he delivered it. The only accessory he installed during overhaul was the engine driven fuel pump, mounted on the nose accessory pad. The mechanic later told the overhaul shop owner that he worked 4 hours per night for a week to get the engine installed in the airframe.

1.3.6 Oil Cooler Overhaul Facility

The Aviation Division Manager for Positech International, Inc., was interviewed by telephone. He reported that Positech International holds FAA Repair Station Certificate PC8R209J, with a limited accessory rating. The company overhauls oil coolers; both aviation and diesel engine applications, and manufactures some coolers for truck applications. They performed the overhaul and reconditioning of the oil cooler installed in the accident engine. Prior to the interview, the FAA Principal Maintenance Inspector for the repair station had obtained at this investigator's request, and provided by facsimile transmission, the Positech work orders and

process records for the oil cooler in question.

The manager was asked to relate the events surrounding the companies processing of the oil cooler. He pointed out several of the documents obtained by the PMI that document the processing of the cooler. According to the work order and discrepancy sheet, they received it on January 25, 2002, and the repair/overhaul was completed on February 25, 2002. The unit was shipped via UPS ground back to the overhaul shop owner on February 26, 2002 (the UPS tracking details appear on the order acknowledgment).

In response to a question concerning a purported telephone conversation between him and the overhaul shop owner seeking the latter's permission to keep the oil cooler to make drawings or a pattern, the manager said they briefly contemplated doing that but decided against manufacturing the cooler. He denied ever asking the overhaul shop owner for such permission. He was advised that the overhaul shop owner claimed that he did not receive the cooler until early April, and the manager again pointed out that the shipping documents clearly show the cooler was shipped on February 26, the day after the repair/overhaul process was completed.

He was asked about an alleged conversation with the overhaul shop owner concerning the brown flaky debris found in the cooler. The manager responded that he remembered having a telephone conversation with the overhaul shop owner, but it concerned a white powdery residue on the shipping plugs. He stated that the overhaul shop owner did not associate the substance with a particular oil cooler (they shipped several back to him around the same time). He advised the overhaul shop owner that step 7 in the repair/overhaul process involved using baking soda in a blasting machine to clean the threads of the oil cooler passage ports. Soda is used because it is completely water soluble and non-abrasive. Following the soda blasting, the cooler is flushed and rinsed. He explained to the overhaul shop owner that the white powdery residue was probably baking soda and for him to flush the cooler. He denied that the overhaul shop owner ever mentioned a brownish colored flaky contaminant, and had he done so, the manager would have insisted that the cooler be returned to Positech.

In response to a question about how the completed oil coolers were packaged for shipment, he stated that they are wrapped in a special corrosion resistant paper, which is taped to seal the unit. Following the paper wrap, the unit is further wrapped in plastic and placed into a foam-protected box. Blue plastic shipping plugs are put into the oil cooler passage orifices to keep debris from entering the cooler.

## 1.4 WRECKAGE AND IMPACT INFORMATION

The accident site is on a 6-lane urban freeway in the city of El Cajon. The airplane collided with the eastern most fence bordering the freeway right of way, then the ground in the northbound lanes of highway 67 about 1/2 mile from the approach end of runway 27R. At the conclusion of the impact sequence, the airplane came to rest inverted. Responding fire department personnel reported that a fuel spill was washed down; however, they could not provide an

estimate of the amount of fuel spilled. An FAA inspector who responded to the scene noted that the spill was under the fuel tank locations in both wings, and, if the total area was considered, would be an oval shape at least 5 feet by 12 feet in dimension. The asphalt in the areas where fuel had leaked was dissolved and softened.

The principal damage to the fuselage was from the nose back to the aft portion of the cabin, with the crush deformation more pronounced on the left side than the right. The engine was displaced back into the firewall about 6 inches. The nose landing gear was cocked 90 degrees and bent back about 30 degrees. Impact marks were noted on the front of the main landing gear struts. The engine was bent downward about 40 degrees.

The right wing exhibited leading edge tip end and root impact damage, with the areas of crush approximating the diameter of a chain link fence post. When the wing was separated from the fuselage center section carry through, heavy exfoliation corrosion was noted to the bottom aluminum spar cap under and around the steel clevis fitting that attaches the wing to the center section. The aileron remained attached to the wing and moved freely; however, the control rod from the center section bell crank to the aileron was fractured at the aileron end rod end fitting. The fracture exhibited angular and granular features and was located at the threaded portion where the rod eye screws into the rod.

The left wing exhibited leading edge damage at two locations; 30 inches outboard from the root and at the tip. When the wing was separated from the fuselage center section carry through, moderate exfoliation corrosion was noted to the bottom aluminum spar cap under and around the steel clevis fitting that attaches the wing to the center section. The aileron remained attached to the wing and moved freely, and the control rod was intact between the center section bell crank and the aileron.

With the exception of the right aileron control rod fracture noted above, control system continuity was established from the cockpit to the empennage and wing surfaces. The cockpit trim control was found in the nearly full down position; about 1 inch of travel remained between the position as found and the full down stop.

The fuel valve was found in the ON position. The left wing fuel tank was intact and contained no fuel; the fuel cap was missing. The right wing fuel tank was crushed and ruptured and contained no fuel. The header tank was crushed and ruptured. The tanks had a faint odor reminiscent of automotive fuel. The gascolator bowl was broken from the cap. No fuel was found in any line or in the carburetor. The fuel pump appeared to be in new condition; the rubber lines were correctly routed and secured to their respective ports and the clamps were tight. The fuel line from the firewall to the carburetor was intact and continuous, with the clamps tight at all fittings (see Tests and Research section for additional fuel system information and findings).

The primer control was found unlocked and out about 1/4 inch. The mixture and throttle controls were in the full rich and full throttle positions. The carburetor heat control was in the

cold position.

A multimeter was used to establish electrical continuity within the magneto switch and through the P-leads to the connector terminals on the magnetos. No ground faults were detected.

A Sensenich M76A K-2 propeller, serial number 38213, was installed on the engine. The hub stampings noted the diameter as 74 inches. With the exception of multidirectional scratch marks on the cambered side, the propeller was undamaged. The spinner was crushed without rotational deformation and formed over the propeller hub nut. Asphalt material was imbedded in the propeller hub nut.

## 1.5 TESTS AND RESEARCH

The engine was removed from the airframe and disassembled for detailed internal examination following recovery of the aircraft from the accident site.

The Data Plate identified the engine as a Teledyne Continental C75-12, serial number 3796-6-12. The case numbers were noted to be a match.

Carburetor was a Stromberg NA S3A1. It was fractured from the intake manifold. The locking nuts that secure the airbox to the carburetor housing were noted to have the stud ends inside the nuts by three nut threads. The wire-style mixture control cable was found separated from the mixture control arm. Detailed visual examination of the mixture arm connector disclosed that the setscrew, which is supposed to secure the wire cable in the arm fitting was not visible in the hole. The wire cable would slip easily in and out of the fitting hole.

The carburetor was disassembled. The bowl was clean and the metal float was intact. The needle vale and seat were normal. The single piece venturi was intact and the jets were clean and clear. The fuel screen was clear. Physical examination of the jets and the carburetor overhaul paperwork disclosed that the jets were for a C85 engine, not a C75.

The magnetos were Slick model 4301's. The nuts securing the P-leads for both magnetos were loose, with the nuts 2-turns from finger tight. The magnetos were tight in the clamps and the timing for both was about 21 degrees. The ignition leads for the Nos. 3 and 4 cylinders were impact damaged and disrupted. During rotation of the crankshaft, bright blue sparks were noted at the spark plug ends of the leads that were not damaged; the leads sparked in cylinder firing order.

No obvious external signs of catastrophic failure were evident. The bottom spark plugs were removed. When the No. 3 bottom plug was unscrewed, about a pint of black oil drained from the plughole. The engine was rotated, with mechanical continuity established through rotation of the magnetos, audible actuation of the fuel pump, and the equal lift of the respective intake and exhaust rocker arms to their like counterparts. The crankshaft rotation was smooth.

Cylinder Nos. 2 and 4 had very weak thumb compression, while Nos. 1 and 3 were strong.

The oil sump was crushed and compromised in three places, principally around the engine crankcase connection flange. During movement of the engine to a disassembly point, at least 3 quarts of black oil drained from the various breaches in the sump. Sampling of the oil revealed no tactilely discernable metal particles; however, it had a gritty feel. When the sump was removed from the engine, no particles were noted in the bottom.

The crankcase breather port and drain line were clear and unobstructed, and no significant amount of oil was present internally in the line. The exhaust tubes exhibited ductile crushing in the bottom rear area of the engine. No metal or significant oily deposits were noted in the exhaust tubes or risers.

The induction air path from the filter element to the carburetor was unobstructed. The carburetor heat box butterfly was in the cold position.

The fuel pump had a new appearance. During actuation of the fuel pump with crankshaft rotation, suction and pressure were detected at the inlet and outlet line fittings. When the rubber fuel lines were removed from the fittings, the outlet fitting was found only finger tight and was easily moved. No fuel staining was evident. The nuts attaching the fuel pump to the crankcase were found to be finger tight. The pump was disassembled and the diaphragm and valves were intact.

The bottom plugs were Auburn SR-88's and were undamaged. The Nos. 1, 3, and 4 were oil fouled; the No. 2 exhibited very light sooty coloration. On the No. 1, the gap was closed on one electrode and gapped at 0.15 on the other. The No. 2 plug center electrode was not ovaled and gapped at 0.018. The No. 3 center electrode was moderately ovaled and gapped at 0.018. The No. 4 exhibited minor ovaling and the gap was measured at 0.018.

The top plugs were Unison UREM-40E's and appeared to be new. The Nos. 1 and 3 were oil soaked. The No. 2 showed minor soot deposits. The No. 4 exhibited light ash gray coloration. The gaps on all of the top plugs were measured at 0.018. Plug Nos. 1, 2, and 4 were only finger tight in the plug bores.

The oil screen was pulled and it was almost completely clogged with material and black colored oil. The material was a combination of small metal particles, a fibrous pliable material and carbon-like flakes. Some of the material adhered to a magnet, including the fibrous-like material.

The oil cooler was removed by separation of the adapter plate from the crankcase. The adapter plate to crankcase gasket was correctly installed. No oil was found inside the cooler. The adapter plate was removed from the cooler and the gasket was found correctly installed and the passages open.

The accessory case was removed from the crankcase. The gears and internal appearance of the accessory case was nominal. The oil pump was disassembled, with the impellors and housing wall unmarked. No foreign debris was found.

The number 3 cylinder was removed. Longitudinal scuffing was observed completely around the piston and on the cylinder walls. Moderate to heavy carbon deposits were noted on the piston crown. An area of black discoloration was noted on the piston in the vicinity of the pin. The cylinder dome and valves were nominal in appearance, except for carbon deposits on each side of the intake and exhaust valves.

The number 4 cylinder was removed. The piston appeared in a nearly new condition. Longitudinal scuffing was observed completely around the piston and on the cylinder walls. Moderate carbon deposits were noted on the piston crown in a circular pattern about 1-inch in diameter under the exhaust and intake valves. An area of black discoloration was noted on the piston in the vicinity of the pin. The cylinder dome and valves were nominal in appearance, except for carbon deposits on each side of the intake and exhaust valves.

The number 2 cylinder was removed. Longitudinal scuffing was observed completely around the piston and on the cylinder walls. Moderate carbon deposits were noted on the piston crown. An area of black discoloration was noted on the piston in the vicinity of the pin. The cylinder dome and valves were nominal in appearance, except for carbon deposits on each side of the intake and exhaust valves.

The number 1 cylinder was removed. The piston had a near new appearance. Longitudinal scuffing was observed completely around the piston and on the cylinder walls. An area of carbon deposits was noted on the piston crown under the exhaust valve. An area of black discoloration was noted on the piston in the vicinity of the pin. The cylinder dome and valves were nominal in appearance, except for carbon deposits on each side of the intake and exhaust valves.

The rings for all pistons were intact, with the sharp edge down.

The crankcase was split. The cam and crankshaft gear timing marks were aligned. All three main bearing inserts were scored, with tactilely discernable ridges and roughness evident. The corresponding crankshaft surfaces were also scored. The bearing journals for the camshaft were also scored, with the corresponding camshaft surfaces scored. The same signatures were noted for the connecting rod bearings and rod journals.

## 1.6 ADDITIONAL INFORMATION

The wreckage was released to the owner at the conclusion of all examinations on June 20, 2002. No components were retained.

## Pilot Information

| | | | |
|---|---|---|---|
| **Certificate:** | Private | **Age:** | 69,Male |
| **Airplane Rating(s):** | Single-engine land | **Seat Occupied:** | Left |
| **Other Aircraft Rating(s):** | Glider | **Restraint Used:** | |
| **Instrument Rating(s):** | None | **Second Pilot Present:** | No |
| **Instructor Rating(s):** | None | **Toxicology Performed:** | No |
| **Medical Certification:** | Class 3 Valid Medical--w/ waivers/lim | **Last FAA Medical Exam:** | November 2, 2001 |
| **Occupational Pilot:** | UNK | **Last Flight Review or Equivalent:** | August 8, 2000 |
| **Flight Time:** | 750 hours (Total, all aircraft), 300 hours (Total, this make and model), 685 hours (Pilot In Command, all aircraft), 1 hours (Last 90 days, all aircraft), 1 hours (Last 30 days, all aircraft) | | |

## Aircraft and Owner/Operator Information

| | | | |
|---|---|---|---|
| **Aircraft Make:** | Ercoupe (Eng & Research Corp.) | **Registration:** | N2948H |
| **Model/Series:** | 415C | **Aircraft Category:** | Airplane |
| **Year of Manufacture:** | | **Amateur Built:** | |
| **Airworthiness Certificate:** | Normal | **Serial Number:** | 3573 |
| **Landing Gear Type:** | Tricycle | **Seats:** | 2 |
| **Date/Type of Last Inspection:** | May 11, 2001 Annual | **Certified Max Gross Wt.:** | 1260 lbs |
| **Time Since Last Inspection:** | 1 Hrs | **Engines:** | 1 Reciprocating |
| **Airframe Total Time:** | 1942 Hrs at time of accident | **Engine Manufacturer:** | Continental |
| **ELT:** | Installed, not activated | **Engine Model/Series:** | C75-12 |
| **Registered Owner:** | Fred L. Province | **Rated Power:** | 75 Horsepower |
| **Operator:** | | **Operating Certificate(s) Held:** | None |

## Meteorological Information and Flight Plan

| | | | |
|---|---|---|---|
| **Conditions at Accident Site:** | Visual (VMC) | **Condition of Light:** | Day |
| **Observation Facility, Elevation:** | KSEE,387 ft msl | **Distance from Accident Site:** | 1 Nautical Miles |
| **Observation Time:** | 12:42 Local | **Direction from Accident Site:** | 270° |
| **Lowest Cloud Condition:** | Clear | **Visibility** | 15 miles |
| **Lowest Ceiling:** | None | **Visibility (RVR):** | |
| **Wind Speed/Gusts:** | 9 knots / 0 knots | **Turbulence Type Forecast/Actual:** | / |
| **Wind Direction:** | 250° | **Turbulence Severity Forecast/Actual:** | / |
| **Altimeter Setting:** | 29.95 inches Hg | **Temperature/Dew Point:** | 20°C |
| **Precipitation and Obscuration:** | No Obscuration; No Precipitation | | |
| **Departure Point:** | El Cajon, CA (KSEE) | **Type of Flight Plan Filed:** | None |
| **Destination:** | | **Type of Clearance:** | VFR |
| **Departure Time:** | 11:40 Local | **Type of Airspace:** | Class D |

## Airport Information

| | | | |
|---|---|---|---|
| **Airport:** | Gillespie Field SEE | **Runway Surface Type:** | Asphalt |
| **Airport Elevation:** | 387 ft msl | **Runway Surface Condition:** | Dry |
| **Runway Used:** | 27R | **IFR Approach:** | None |
| **Runway Length/Width:** | 5341 ft / 100 ft | **VFR Approach/Landing:** | Forced landing;Traffic pattern |

## Wreckage and Impact Information

| | | | |
|---|---|---|---|
| **Crew Injuries:** | 1 Serious | **Aircraft Damage:** | Destroyed |
| **Passenger Injuries:** | | **Aircraft Fire:** | None |
| **Ground Injuries:** | N/A | **Aircraft Explosion:** | None |
| **Total Injuries:** | 1 Serious | **Latitude, Longitude:** | 32.799999,-116.949996 |

## Administrative Information

| | |
|---|---|
| **Investigator In Charge (IIC):** | Rich, Jeff |
| **Additional Participating Persons:** | Mike Arnold; Federal Aviation Administration; San Diego, CA |
| **Report Date:** | March 16, 2004 |
| **Last Revision Date:** | |
| **Investigation Class:** | Class |
| **Note:** | |
| **Investigation Docket:** | https://data.ntsb.gov/Docket?ProjectID=54698 |