Aviation Investigation Final Report

Location:	KINGMAN, Arizona	**Accident Number:**	LAX99FA128
Date & Time:	March 20, 1999, 09:23 Local	**Registration:**	N94818
Aircraft:	Ercoupe (Eng & Research Corp.) 415E	**Aircraft Damage:**	Destroyed
Defining Event:		**Injuries:**	2 Fatal
Flight Conducted Under:	Part 91: General aviation - Personal		

Analysis

A ground-based witness, located north of the airport, reported observing the accident airplane's wings rolling right and left to nearly a vertical bank. Thereafter, the airplane entered a spin and impacted the ground while in a 30- to 45-degree nose low pitch attitude. The impact site was 0.6 miles from the approach end of the runway. Pilots ahead and behind the airplane reported experiencing moderate to extreme turbulence in the traffic pattern. The surface wind was reported at 14 knots with gusts to 22 knots. At the time of the accident the airplane was calculated to be between 94 and 127 pounds over its maximum certificated 1,400 pounds gross weight. During the on scene wreckage examination, the left wing's rear spar attachment fitting was found severely corroded, with missing rivet heads and was separated. Metallurgical examination of the severely corroded spar attachment fitting revealed the presence of rivet heads that had failed and popped off in flight and an associated corrosion-related crack that had compromised the structural integrity of the fitting assembly. Unable to sustain the imposed wing loading, the fitting failed in flight. The failed rivet heads and evidence of the corrosion was on the backside of the spar in an area not visible during inspections. In 1995, a one-time visual inspection of the wings' internal structure for corrosion was mandated by the Federal Aviation Administration through issuance of Airworthiness Directive 94-18-04. This 'one time' visual inspection requirement was complied with according to a logbook entry dated 1997, and thereafter the wings were recovered with fabric. In May 1998, the pilot purchased the airplane, which had been manufactured in 1948. In September 1998, the airplane received another annual inspection during which no logbook entry was made indicating that the wing's internal structure had been reexamined for evidence of corrosion. The corrosion developed due to the presence of moisture and the dissimilar metals (steel bracket riveted to an aluminum spar) being in contact with each other. The severity of the ongoing corrosion process between the metal components would not have been evident during an external visual inspection, despite the fact that a required access panel had not been installed pursuant to the AD. The AD inadequately addressed the aging aircraft issue by

indicating compliance could be achieved through performance of a one-time visual inspection to ferret out nonviewable evidence of internal corrosion.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be: The in-flight loss of airplane control due to rear wing spar attachment fitting failure. The failure resulted from severe corrosion that was undetected during performance of an inspection specified by an airworthiness directive. The airworthiness directive developed by the FAA was deficient in its specificity relating to recurrence. The directive was also deficient in its procedure requiring external inspection, which would not reveal development of internal corrosion. Contributing factors to the accident were the turbulent atmospheric condition that exacerbated the wing loading and the pilot's operation of the airplane in excess of maximum authorized gross weight.

Findings

Occurrence #1: AIRFRAME/COMPONENT/SYSTEM FAILURE/MALFUNCTION
Phase of Operation: APPROACH - VFR PATTERN - BASE LEG/BASE TO FINAL

Findings
1. (C) WING,SPAR - CORRODED
2. MAINTENANCE,INSPECTION - INADEQUATE - OTHER MAINTENANCE PERSONNEL
3. (C) PROCEDURE INADEQUATE - FAA(OTHER/ORGANIZATION)
4. (C) WING,SPAR - FAILURE,PARTIAL
5. (F) WEATHER CONDITION - TURBULENCE
6. (F) AIRCRAFT WEIGHT AND BALANCE - EXCEEDED - PILOT IN COMMAND

Occurrence #2: LOSS OF CONTROL - IN FLIGHT
Phase of Operation: APPROACH - VFR PATTERN - BASE TURN

Findings
7. AIRCRAFT CONTROL - NOT POSSIBLE - PILOT IN COMMAND

Occurrence #3: IN FLIGHT COLLISION WITH TERRAIN/WATER
Phase of Operation: DESCENT - UNCONTROLLED

Findings
8. TERRAIN CONDITION - OPEN FIELD

Factual Information

HISTORY OF FLIGHT

On March 20, 1999, at 0923 hours mountain standard time, an Ercoupe 415E, N94818, owned and operated by the pilot, experienced an in-flight structural failure on approach to the Kingman Airport, Kingman, Arizona. Visual meteorological conditions prevailed, and no flight plan was filed. The airplane impacted level, desert terrain and was destroyed. The private pilot and passenger were fatally injured during the personal flight that was performed under 14 CFR Part 91. The flight originated from Lake Havasu City, Arizona, about 0830.

The pilot was a member of the Arizona Ercoupe Group and along with other members, was participating in its annual Wing Ding Fly-in. The initial portion of the flight involved traveling to the Kingman Airport, where breakfast was to be served, and other activities related to the fly-in were planned. The pilot's airplane was refueled, and he was observed to have performed a preflight inspection of his airplane.

Approaching the uncontrolled Kingman Airport, the pilot broadcast his position. He did not indicate that he was experiencing any difficulty controlling the airplane. Within 10 minutes before and after the accident, other pilots in the group also entered the Kingman traffic pattern. They reported to the National Transportation Safety Board investigator that moderate to extreme turbulence was encountered in the pattern. Several pilots also reported experiencing windshear while descending on the base and final approach legs.

A ground-based witness, located north of the airport, reported observing the accident airplane's wings rolling right and left to nearly a vertical bank. Thereafter, as the airplane turned (onto final approach) toward the airport it rolled over, and rotated round and round as it rapidly descended.

PERSONNEL INFORMATION

Based upon information contained in the pilot's personal flight record logbook, the pilot began receiving flight instruction in 1964. He received a private pilot certificate in 1967. The flight test was performed in an Ercoupe 415-C airplane. Thereafter, the pilot continued flying Ercoupes until July 1969, when he stopped all of his piloting activities. By 1969 he had logged a total of 193 hours.

After a lapse of about 29 years, he resumed flying in June 1998. On June 1 and on October 4 and 6, 1998, the pilot received instruction with a certified flight instructor for a total of 2.7 hours. He passed a biennial flight review on October 6, 1998 in the accident airplane.

Between October 8, 1998, and March 14, 1999, the pilot's logbook indicates he only flew the accident airplane. During this period he made about 64 flights. By March 14, the date of his last logged flight, his total time was approximately 252 hours.

The pilot's wife reported that her husband's flight experience was "limited" with most experience being on local area flights. Her son (the passenger) had not taken flying lessons. He was riding with his father as a passenger as he had on about 10 previous occasions.

Neither the pilot nor son held Federal Aviation Administration (FAA) airframe or powerplant mechanic certificates.

AIRCRAFT INFORMATION

The airplane was manufactured in 1948. By the accident date, the airframe's approximate total time was 1,887 hours. The pilot purchased the airplane in May 1998.

After undergoing several modifications including installation of a new baggage compartment, seats, instrument panel, avionics, and rudder pedals, the airplane was reweighed in September 1997 and in December 1998. In September and December, its listed empty weight was listed as 1,016 and 983 pounds, respectively. The airplane's maximum certificated gross weight was 1,400 pounds. Accordingly, its useful load was listed as being 384 or 417 pounds.

The last logbook entry referencing the airplane's weight and balance computation indicates its gross empty weight was 1,016 pounds.

Regarding the airplane's loading, information was obtained from a combination of the pilot and passenger's state driver records, a verbal report from the medical examiner, from the pilot's last FAA aviation medical examination, and from fueling records. In addition, the Safety Board investigator made an estimate for the fuel burned off during the accident flight. The calculated total gross weight at the time of the accident was approximately 1,527 pounds (the calculations are appended to this report, see the exhibit for additional details).

The airplane was maintained on a program of annual inspections. Regarding wing-related inspections and maintenance, according to the airplane's logbooks in November 1992, the wing covering was removed. The wings were inspected for corrosion and damage, and then they were recovered.

In 1995, Airworthiness Directive (AD) 94-18-04 became effective. According to this AD, it was issued "to prevent wing damage caused by a corroded wing outer panel structural component, which, if not detected and corrected, could progress to the point of structural failure . . . ."

On October 1, 1997, the airplane received an annual inspection, and on this date a "Major Repair and Alteration, FAA Form 337" was completed. In pertinent part, listed maintenance on this form addressed removal of the airplane's old wing covering and inspection of both wings

for corrosion and damage. Thereafter, the wings were again recovered.

The airplane's logbook references work accomplished and states, in part, that new wing attachment hardware was installed. Also, AD 94-18-04 was listed as having been complied with. The airplane engine's recording tachometer was noted at 21.8 hours, and the airplane's total time was listed as 1,815.7 hours.

The last annual inspection was accomplished on September 29, 1998. There was no listing of any maintenance related to repairing damage, or to any inspection of the wing's internal structure. The engine's tachometer was noted at 22 hours, and the total airplane time was 1,816 hours.

METEOROLOGICAL INFORMATION

The closest official weather observation station to the accident site was located at the Kingman Airport. In pertinent part, at 0923 Kingman reported clear sky and 10 miles visibility. The surface wind was from 150 degrees at 14 knots, with gusts to 22 knots.

About the time of the accident, several pilots were flying light airplanes in the vicinity of the Kingman Airport. In summary, one pilot reported that he landed on runway 21 about 5 minutes prior to the accident. The pilot stated that he experienced moderate turbulence turning from the base to the final approach legs.

A pilot flying an Ercoupe reported that he had followed the accident airplane in the traffic pattern. The pilot stated that he experienced "extreme turbulence" approaching runway 21.

Another pilot reported that he had been on final approach to runway 21 in an Alon Aircoupe when he overheard the accident pilot announce his position as being on the base leg. The Alon pilot reported that his airplane's wings were "flipping. . . 40 degrees both ways" as he approached the airport, and he experienced "severe turbulence" on the final approach course.

A pilot flying a Piper Cherokee reported that he experienced "severe wind" and turbulence in the traffic pattern. The pilot estimated the wind speed at 40 knots, or greater. The pilot and his passenger observed the accident airplane turn onto the final approach leg. They described the accident airplane's bank angle during its turn as 30 to 45 degrees, or steeper.

A pilot flying a Lucsombe reported that he landed a few minutes after the accident had occurred. This pilot reported experiencing two major wind shifts during his approach. Also, between 1015 and 1030, he observed a large dust devil pass by the airport.

A ground-based witness, who observed the accident airplane descend, reported that while she was driving by the airport her automobile was buffeted by the strong wind.

COMMUNICATION

None of the pilots who were in the vicinity of the Kingman Airport reported hearing any transmission from the accident pilot in which he indicated that he was experiencing any difficulty.

WRECKAGE AND IMPACT INFORMATION

An on scene examination of the accident site and airplane wreckage was performed. The site was located on level ground, approximately 0.6 miles north-northeast (025 degrees, magnetic) from the approach end of runway 21. The accident site coordinates are approximately 35 degrees 16.3 minutes north latitude by 113 degrees 55.5 minutes west longitude. The elevation is about 3,400 feet mean sea level (msl). The pilot's impact-damaged wristwatch was observed stopped at 0923.

The airplane was found in an upright attitude and on a magnetic heading of about 280 degrees. The airplane was located on top of a 1-foot-deep impact crater that was about 8 feet long by 4 feet wide. Fragments from the airplane's shattered red colored left wing's navigation light lens were found in the ground next to the tip of the left wing.

Cockpit-related materials and airplane components were found in the field ahead of the airplane. In part, the items included: (1) the pilot's personal flight record logbook; (2) a control yoke grip; (3) the left main landing gear fairing; (4) a canopy fragment; (5) the magnetic compass; and (6) two fuel tank caps. These items were found from 5 to 291 feet west of the main wreckage. (See the wreckage diagram appended to this report for additional details.)

All flight control surfaces were found with the airframe. The aileron push/pull control tubes were all found connected to the ailerons.

The airplane's engine compartment and cockpit was observed crushed in an aft direction. The entire engine compartment was found displaced about 2 feet rearward, and was bent in an estimated 30 to 45 degree upward direction. The pilot's (left side) control yoke was observed broken at its lower attachment fitting. The right side control yoke was observed connected to its attachment fitting, but it was found bent.

The tail was found bent about 90 degrees upward. The left and right rudder assemblies remained attached to their respective hinges. Their interconnection system was intact.

The propeller was found torsionally twisted, bent into an "S" shape, scratched on its cambered surface in a chordwise direction, and with its leading edge nicked. The engine tachometer was observed indicating 92.6 hours. There was no evidence of fire.

The leading edges of both wings were found accordioned in an aft direction, with associated compressive buckling noted to the internal rib structure. The main wing spar-to-fuselage attachments were found intact.

The attachment fitting for the inboard portion of the left wing's aft spar was observed broken from adjacent airframe structure (see the sheriff's photograph). The fitting appeared corroded, and the heads of several rivets in the fitting were missing. The corresponding portion of the right wing's aft spar was found attached to the airframe.

MEDICAL AND PATHOLOGICAL INFORMATION

An autopsy was performed under the direction of the Mohave County Sheriff's department at the Mohave Regional Medical Center, 3269 Stocktonhill Road, Kingman, Arizona 86401.

The FAA's Civil Aeromedical Institute (CAMI), Toxicology and Accident Research Laboratory, performed toxicology tests on specimens from the pilot. No evidence of drugs was found. Ethanol was detected; however, its presence was attributed by the laboratory management to postmortem production.

TESTS AND RESEARCH

Airworthiness Directive 94-18-04 (Univair Service Bulletin No. 29, Revision B) required a visual inspection of outer wing panel structure for evidence of corrosion. The accident airplane was subject to the referenced AD, which required a "one time" visual structural inspection.

In part, this AD addressed the issue of identifying and preventing severe corrosion in the outer wing panel structure, which included the area where the inboard portion of the rear spar attachment fitting (bracket) was located. As indicated in the service bulletin (incorporated in the AD), the original design of the wing did not provide adequate means for routine visual examination of the wing's interior surfaces. Consequently, this AD was issued to provide for the installation of inspection openings to allow for "complete visual access to the wing panel structure." The wing skin on the accident airplane was found with inspection (access) holes. An inspection hole in the wing fabric was found in the vicinity of the inboard left wing spar attachment area, as indicated by SB No. 29 (see diagram).

Under the direction of the Safety Board investigator, SEAL Laboratories, El Segundo, California, performed a metallurgical examination of the inboard portion of the aft spar attachment structure. The examination included the broken attachment fitting from the left wing, and the corresponding intact right wing fitting.

In pertinent part SEAL reported that severe corrosion was evident between the steel hinge (bracket) and the aluminum sheet metal from the left wing's rear spar. The corrosion process was aggressive due to dissimilar metals in contact with each other in the presence of moisture. During the corrosion process, the aluminum sheet corroded from the side in contact with the steel hinge assembly and progressed by exfoliation corrosion. This corrosion would not be visible on the parts' external surface (which would be visible from an inspection hole). The report stated, "The aluminum rivets (that secured the bracket to the spar) also corroded to

the point that the heads started popping off gradually, one by one." (The Safety Board and FAA airworthiness investigator noted that the rivet heads were located on the backside of the spar. They were not visible from the viewing location prescribed by the AD.)

SEAL Laboratories further reported that since the corrosion products present on the fracture surface of several rivets was excessive, these rivets had definitely failed prior to the accident. Also, the aluminum sheet (rear spar) initiated a corrosion crack that progressed to the point where the structural integrity of the assembly was compromised, and the assembly failed in flight.

SEAL additionally reported that similar corrosion existed at the interface between the aluminum sheet and the steel hinge in the right wing. However, the corrosion on the right hinge assembly was not as severe.

According to the Univair Aircraft Corporation, the Ercoupe parts catalog identifies the attachment bracket as being a "hinge assembly - rear." Its part number is 415-14020-L.

ADDITIONAL INFORMATION

The main airplane wreckage was released to the owner's assigned insurance company adjuster on May 20, 1999. Subsequently, the law firm representing the deceased pilot was verbally notified of its release about July 2000.

Pilot Information

Certificate:	Private	**Age:**	64,Male
Airplane Rating(s):	Single-engine land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	
Instrument Rating(s):	None	**Second Pilot Present:**	No
Instructor Rating(s):	None	**Toxicology Performed:**	Yes
Medical Certification:	Class 3 Valid Medical--w/ waivers/lim	**Last FAA Medical Exam:**	November 11, 1997
Occupational Pilot:	No	**Last Flight Review or Equivalent:**	
Flight Time:	254 hours (Total, all aircraft), 23 hours (Total, this make and model), 219 hours (Pilot In Command, all aircraft), 23 hours (Last 90 days, all aircraft), 12 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	Ercoupe (Eng & Research Corp.)	**Registration:**	N94818
Model/Series:	415E 415E	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	
Airworthiness Certificate:	Normal	**Serial Number:**	4932
Landing Gear Type:	Tricycle	**Seats:**	2
Date/Type of Last Inspection:	September 29, 1998 Annual	**Certified Max Gross Wt.:**	1400 lbs
Time Since Last Inspection:	71 Hrs	**Engines:**	1 Reciprocating
Airframe Total Time:	1887 Hrs	**Engine Manufacturer:**	Continental
ELT:	Installed	**Engine Model/Series:**	C85-12F
Registered Owner:	CARMINE YUPPA	**Rated Power:**	85 Horsepower
Operator:		**Operating Certificate(s) Held:**	None
Operator Does Business As:		**Operator Designator Code:**	

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual (VMC)	**Condition of Light:**	Day
Observation Facility, Elevation:	IGM ,3449 ft msl	**Distance from Accident Site:**	1 Nautical Miles
Observation Time:	09:23 Local	**Direction from Accident Site:**	205°
Lowest Cloud Condition:	Clear	**Visibility**	10 miles
Lowest Ceiling:	None	**Visibility (RVR):**	
Wind Speed/Gusts:	14 knots / 22 knots	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	150°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30 inches Hg	**Temperature/Dew Point:**	19°C / 2°C
Precipitation and Obscuration:	No Obscuration; No Precipitation		
Departure Point:	LAKE HAVASU CTY, AZ (HII)	**Type of Flight Plan Filed:**	None
Destination:	(IGM)	**Type of Clearance:**	None
Departure Time:	08:30 Local	**Type of Airspace:**	Class E

Airport Information

Airport:	KINGMAN IGM	**Runway Surface Type:**	Asphalt
Airport Elevation:	3449 ft msl	**Runway Surface Condition:**	Dry
Runway Used:	21	**IFR Approach:**	None
Runway Length/Width:	6831 ft / 150 ft	**VFR Approach/Landing:**	Traffic pattern

Wreckage and Impact Information

Crew Injuries:	1 Fatal	**Aircraft Damage:**	Destroyed
Passenger Injuries:	1 Fatal	**Aircraft Fire:**	None
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	2 Fatal	**Latitude, Longitude:**	35.240016,-113.760955(est)

Administrative Information

Investigator In Charge (IIC):	Pollack, Wayne
Additional Participating Persons:	LEO BELMONTE; LAS VEGAS , NV RANDY PRINE; SCOTTSDALE , AZ MICHAEL GRIMES; LANCASTER , CA
Original Publish Date:	April 6, 2001
Last Revision Date:	
Investigation Class:	Class
Note:	
Investigation Docket:	https://data.ntsb.gov/Docket?ProjectID=45967