



# Aviation Investigation Final Report

<b>Location:</b>	Richmond, California	<b>Accident Number:</b>	WPR14FA174
<b>Date &amp; Time:</b>	April 27, 2014, 16:06 Local	<b>Registration:</b>	N4962U
<b>Aircraft:</b>	Cessna 210E	<b>Aircraft Damage:</b>	Destroyed
<b>Defining Event:</b>	Midair collision	<b>Injuries:</b>	1 Fatal
<b>Flight Conducted Under:</b>	Part 91: General aviation - Personal		

## Analysis

The Sea Fury pilot and the Cessna pilot had flown their airplanes to a nearby airport to display them at an open house. The two pilots then briefed the return flights with each other and determined their flight routes. The Sea Fury departed, flew over the airport, and rendezvoused with another airplane for a photo shoot. They flew several 360-degree patterns, and the Sea Fury pilot observed the Cessna during one of his turns, and noted that it was on the briefed course. He completed the photo work and set his course for the return to their home airport.

The Sea Fury pilot made radio contact with the Cessna pilot on a common, briefed frequency, and the Cessna pilot responded with his position. The Sea Fury pilot made visual contact with the Cessna forward and to the left, and the Cessna pilot responded that he had visual contact of the Sea Fury. The Cessna's airspeed was about 150 knots, and the Sea Fury's airspeed was about 200 knots. Approaching from well behind, the Sea Fury pilot advised the Cessna pilot that the Sea Fury was low and to the left. The Cessna pilot acknowledged visual contact again and broadcast that he wanted to take a picture. The Sea Fury pilot replied that there would probably not be time due to the speed differential. The Sea Fury pilot observed the trajectory and flight profile of the Cessna abruptly change to a left roll so that he could see the top of the Cessna's wing. The Sea Fury pilot attempted to avoid the Cessna by pitching his airplane nose down; however, he felt and heard a thump and realized that the two airplanes had collided. He pulled up and looked over his shoulder; he observed the Cessna inverted and going down. He squawked code 7700 on the transponder, and, due to communications issues, reported the midair collision and position of the Cessna to air traffic control via relay by another aircraft pilot.

The Sea Fury pilot initiated a climb, and conducted a controllability check; he determined that he could control the airplane in the current configuration. He continued to his home airport and made a successful full-stop landing.

The Sea Fury pilot stated that there were no mechanical malfunctions or failures with the airplane that would have precluded normal operation. Examination of the Sea Fury and the recovered portions of the

Cessna did not reveal any anomalies that would have precluded normal operation of the airplanes.

The last couple of minutes of data points from a GPS unit in the Cessna indicated a northeasterly track at GPS-derived groundspeeds of about 150 knots. The last few data points indicated that the airplane began to descend with varied groundspeeds, and the final data point was 212 knots at 854 ft. A review of recorded radar data showed two targets with one target approaching from behind and low. As the targets merged, the data points could not be attributed to either airplane because they were within the accuracy limits of the transmitting/recording systems.

## Probable Cause and Findings

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

Both pilots' failure to maintain adequate clearance from each other during cruise flight while in visual contact with each other. Contributing to the accident was the unexpected abrupt maneuver made by the pilot.

### Findings

<b>Personnel issues</b>	Monitoring other aircraft - Pilot
<b>Personnel issues</b>	(general) - Pilot
<b>Personnel issues</b>	Monitoring other aircraft - Pilot of other aircraft

## Factual Information

### History of Flight

#### Maneuvering

Midair collision (Defining event)

On April 27, 2014, about 1606 Pacific daylight time, a Cessna 210E, N4962U, and a Hawker Sea Fury TMK 20, N20SF, collided in flight near Richmond, California. Sanders Aircraft, Inc., was operating both airplanes under the provisions of Title 14 Code of Federal Regulations (CFR) Part 91. The private pilot in the Cessna sustained fatal injuries; the commercial pilot and one passenger in the Sea Fury were not injured. The Cessna was destroyed during the accident sequence, and the Sea Fury sustained substantial damage to the empennage. Both cross-country personal flights departed Half Moon Bay, California; the Sea Fury departed about 1530, and the Cessna departed about 1538. Both airplanes were en route to Eagle's Nest Airport, Ione, California. Visual meteorological conditions prevailed, and no flight plans had been filed.

The National Transportation Safety Board (NTSB) investigator-in-charge (IIC) interviewed the Sea Fury pilot, and the operator submitted a Pilot/Operator accident report, NTSB form 6120.1. The Sea Fury pilot and the Cessna pilot had flown their airplanes to Half Moon Bay to display them at an open house for the airport. The two pilots briefed the flight home, and determined their route of flight. The Sea Fury departed, flew overhead the airport, and rendezvoused with a Beechcraft A36 Bonanza for a photo shoot over the Golden Gate Bridge in San Francisco, California. They flew several 360-degree patterns over the bridge, and the pilot observed the Cessna during one of his turns, and noted that it was on the briefed course. He completed the photo work, and set his course for the return to Ione.

The Sea Fury pilot made radio contact with the Cessna pilot on a common, previously briefed frequency, and the Cessna pilot responded with his position. The Sea Fury pilot made visual contact with the Cessna, which was forward and to the left of his position, and the Cessna pilot responded that he had visual contact of the Sea Fury. The operator reported that the Cessna's airspeed was approximately 150 knots, and the airplane was under 3,000 feet msl. The Sea Fury's airspeed was approximately 200 knots, and the airplane was under 3,000 feet msl. The Sea Fury pilot stated that he would pass the Cessna low and to the left.

Approaching from well behind, the Sea Fury pilot advised the Cessna pilot that the Sea Fury was low and to the left. The Cessna pilot acknowledged visual contact again, and broadcasted that he wanted to take a picture. The Sea Fury pilot replied that there would probably not be time due to the speed differential. The Sea Fury pilot observed the trajectory and flight profile of the Cessna abruptly change to a left roll so that he could see the top of the Cessna's wing. The Sea Fury pilot attempted to evade by pitching his airplane nose down; however, he felt and heard a thump, and realized that the two airplanes had collided. He pulled up and looked over his shoulder; he observed the Cessna inverted and going down. He squawked code 7700 on the transponder, and due to communications issues, reported the mid-air and position of the Cessna to air traffic control via relay by another aircraft.

The Sea Fury pilot concentrated on flying his airplane. He initiated a climb, and conducted a

controllability check; he determined that he could control the airplane in the current configuration. He wanted to avoid populated areas, so he continued toward his home airport. He contacted company personnel, who decided to fly another company airplane to meet him, and examine the Sea Fury's condition. The Sea Fury pilot lowered the landing gear, and did a controllability check, which included turns. He lowered the flaps, and repeated the testing. He reduced airspeed to a landing compatible speed of 130 mph, and checked controllability again; he determined that he had adequate control to land. He had to abort the first landing attempt at his home airport due to emergency equipment on the runway; he made a full stop landing on runway 19 on the second attempt.

## Pilot Information

<b>Certificate:</b>	Private	<b>Age:</b>	33, Male
<b>Airplane Rating(s):</b>	Single-engine land	<b>Seat Occupied:</b>	Left
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	Unknown
<b>Instrument Rating(s):</b>	None	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	Yes
<b>Medical Certification:</b>	Class 3 Without waivers/limitations	<b>Last FAA Medical Exam:</b>	February 28, 2012
<b>Occupational Pilot:</b>	No	<b>Last Flight Review or Equivalent:</b>	July 26, 2012
<b>Flight Time:</b>	285 hours (Total, all aircraft), 37 hours (Total, this make and model), 159 hours (Pilot In Command, all aircraft), 6 hours (Last 90 days, all aircraft), 2 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

### Cessna 210 Pilot

The operator reported that the 33-year-old pilot held a private pilot certificate with a rating for airplane single-engine land. The pilot held a third-class medical certificate that was issued on February 28, 2012, with no limitations or waivers. The pilot also had an airframe and powerplant mechanic's certificate.

The operator reported that the pilot had a total flight time of 285 hours. He logged 6 hours in the last 90 days, and 2 in the previous 30 days. He had an estimated 37 hours in this make and model. He completed a flight review on July 26, 2012.

### Sea Fury Pilot

The 52-year-old pilot reported that he held a commercial pilot certificate with ratings for airplane single-engine land, multiengine land, and instrument airplane. He held a second-class medical certificate issued on April 16, 2014, with the limitation that he must have reading glasses. He had an airframe and powerplant mechanic's certificate.

The operator reported a total flight experience of 5,646 hours, and a total of 143 flight hours in the accident airplane make and model. He completed a flight review on October 1, 2012.

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	Cessna	<b>Registration:</b>	N4962U
<b>Model/Series:</b>	210E	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>	1965	<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Normal	<b>Serial Number:</b>	21058662
<b>Landing Gear Type:</b>	Retractable - Tricycle	<b>Seats:</b>	6
<b>Date/Type of Last Inspection:</b>	September 10, 2013 Annual	<b>Certified Max Gross Wt.:</b>	3097 lbs
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	1 Reciprocating
<b>Airframe Total Time:</b>	6384 Hrs as of last inspection	<b>Engine Manufacturer:</b>	CONT MOTOR
<b>ELT:</b>	Installed	<b>Engine Model/Series:</b>	IO 520-A
<b>Registered Owner:</b>	SANDERS AIRCRAFT INC	<b>Rated Power:</b>	285 Horsepower
<b>Operator:</b>	SANDERS AIRCRAFT INC	<b>Operating Certificate(s) Held:</b>	None

### Cessna 210E

The airplane had a high wing with a single-engine; it was serial number 21058662. The operator reported that the airplane had a total airframe time of 6,384 hours at the most recent annual inspection dated September 10, 2013.

The engine was a Continental Motors Inc. (CMI) IO-520A, serial number 112377R. The operator reported that the time since major overhaul was 468 hours.

### Sea Fury

The airplane had a low wing with a single engine; it was serial number ES9505. The operator reported that the airplane had a total airframe time of 6,378 hours at the most recent annual inspection dated August 1, 2013.

The engine was a Pratt & Whitney R4360, serial number PS15867A. The operator reported that the time since major overhaul was 85.2 hours.

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual (VMC)	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	KOAK	<b>Distance from Accident Site:</b>	
<b>Observation Time:</b>	15:53 Local	<b>Direction from Accident Site:</b>	
<b>Lowest Cloud Condition:</b>	Few / 1700 ft AGL	<b>Visibility</b>	10 miles
<b>Lowest Ceiling:</b>	Broken / 11000 ft AGL	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	15 knots /	<b>Turbulence Type Forecast/Actual:</b>	/ None
<b>Wind Direction:</b>	260°	<b>Turbulence Severity Forecast/Actual:</b>	/ N/A
<b>Altimeter Setting:</b>	30.09 inches Hg	<b>Temperature/Dew Point:</b>	17°C / 8°C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	Half Moon Bay, CA (HAF )	<b>Type of Flight Plan Filed:</b>	None
<b>Destination:</b>	Ione, CA (CA20)	<b>Type of Clearance:</b>	None
<b>Departure Time:</b>	15:38 Local	<b>Type of Airspace:</b>	

An aviation routine weather report (METAR) for Oakland (KOAK), California, (elevation 9 feet, 11 nautical miles (nm) southeast of the accident site) was issued at 1553 PDT. It stated: wind from 260 degrees at 15 knots; visibility 10 miles; few clouds at 1,700 feet; temperature 17/63 degrees C/F; dew point 8/46 degrees C/F; altimeter 30.09 inches of mercury.

## Airport Information

<b>Airport:</b>	Eagles Nest CA20	<b>Runway Surface Type:</b>	
<b>Airport Elevation:</b>	220 ft msl	<b>Runway Surface Condition:</b>	Unknown
<b>Runway Used:</b>		<b>IFR Approach:</b>	None
<b>Runway Length/Width:</b>		<b>VFR Approach/Landing:</b>	None

## Wreckage and Impact Information

<b>Crew Injuries:</b>	1 Fatal	<b>Aircraft Damage:</b>	Destroyed
<b>Passenger Injuries:</b>		<b>Aircraft Fire:</b>	None
<b>Ground Injuries:</b>	N/A	<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	1 Fatal	<b>Latitude, Longitude:</b>	37.984165,-122.414169(est)

Detailed reports on follow-up examinations of both airplanes are part of the public docket for this

accident, and can be accessed by the Accident Docket link on the [ntsb.gov](https://www.ntsb.gov) home page.

## Cessna 210

The Cessna 210 came to rest in about 10 feet of water in San Pablo Bay near Richmond, and the wreckage was retrieved on April 30. The recovered wreckage consisted of the fuselage and the engine. Neither wing was recovered. The propeller separated from the crankshaft, and was not located.

## Sea Fury

The Sea Fury landed at its home base.

The Sea Fury was silver with dark blue and red accents. The Cessna had blue wingtips; it also had blue paint on the leading edge of both wings, on top of the cowling, and along the sides of the fuselage.

The IIC and an inspector from the Federal Aviation Administration examined the Sea Fury. The top remaining portion of the vertical stabilizer was crushed aft and down with blue paint transfer marks on the aft portion of the remaining metal. The operator reported that the missing vertical stabilizer section was about 12 inches long. The rudder had crush damage. The right elevator separated outboard of the middle hinge; about 2 feet of the elevator was missing. About 3 feet of the outboard section of the right horizontal stabilizer was missing. The outboard fracture surface was jagged and angular, and the upper surface had crushed inboard in an accordion fashion. Investigators observed blue paint transfer marks and scratches on the upper skin surface and within the folds of the metal. The scratches were a few degrees (outboard to inboard) from alignment with the longitudinal axis of the airframe.

The bottom of the right horizontal stabilizer had two slash cuts that were similar in shape to a propeller blade; the cuts were almost perpendicular to the chord line. The marks were 10 inches apart from trailing edge to trailing edge, and 4 inches wide near their end point (tip). The metal was pushed up into the horizontal stabilizer cavity, and had black paint transfer on the metal surfaces. The forward cut was through both the bottom and top skins, and the edges of the cut in the top skin were curled up.

## Medical and Pathological Information

---

An autopsy was conducted by Contra Costa County Office of the Sheriff- Coroner. The cause of death was reported as multiple blunt force injuries.

Toxicological tests on specimens recovered from the Cessna 210 pilot were performed by the FAA Civil Aerospace Medical Institute Forensic Toxicology Research Team. Analysis of the specimens for the pilot contained no findings for volatiles or tested drugs. They did not perform tests for carbon monoxide or cyanide.

## Tests and Research

---

Investigators examined the recovered wreckage of the Cessna 210 at Plain Parts, Sacramento, California, on May 6, 2014. A full report is contained within the public docket for this accident, and is accessible via the Accident Docket link on the ntsb.gov home page.

### Airframe

Only the inboard portion of the left wing spar was recovered, and continuity could not be established for the ailerons. Continuity was established for the elevators and rudder.

The airframe manufacturer's investigator determined that the landing gear was in the up position. The flap actuator was not recovered; the indicator was full down, but the handle was in a neutral position. The investigator determined that the elevator trim was in the neutral position.

### Engine

The engine separated during the accident sequence. The front and left side of the engine sustained the most damage; cylinder number six's front fins were crushed aft, the exhaust valve spring was missing, the exhaust valve was bent aft, and the associated portion of the rocker shaft was missing. The fracture surface on the remaining portion of rocker shaft was jagged and angular. The intake push rod for cylinder number five was severely bent.

The crankshaft was manually rotated with a drive bar on the propeller mounting bolts. The crankshaft rotated with some resistance; and the valves for cylinders one, two, three, and four moved approximately the same amount of lift. The gears in the accessory case turned freely. Thumb compression was obtained on cylinders one, two, three, and four.

The spark plug electrodes corresponded to normal operation according to the Champion Aviation Check-A-Plug AV-27 Chart. Several plugs were caked with mud.

A borescope inspection revealed no mechanical deformation on the valves, cylinder walls, or internal cylinder head.

The propeller flange was bent adjacent to the serial number, and the crankshaft cracked aft of the flange on the opposite side.

The gascolator screen was clean; there was some contamination in the bowl, and white, bubbly discoloration was evident. The engine driven fuel pump drive gear was undamaged, and the pump rotated freely. The throttle body screen was clean. The mixture shaft rotated freely from stop to stop; the throttle shaft rotated freely. The metering unit of the throttle body separated; but it was located in the wreckage, and remained attached to the mixture control cable. The manifold valve was not recovered.

The oil pump had light scoring on the internal walls; no deformation was observed on the gears.



## Additional Information

---

### Cessna 210 GPS Data Extraction

A Garmin GPSMAP 496 battery powered portable unit was recovered from the wreckage. The unit sustained crush and water damage, but the NTSB Recorders Laboratory used forensic equipment to successfully extract data from the nonvolatile memory chip. A complete report is part of the public docket for this accident. The IIC converted all times to PDT. The Garmin GPSMAP 496 was WAAS enabled, which can increase the accuracy of the GPS data by using ground stations to correct the signal; however, the recorded data lacked information regarding satellite signal quality and ground station utilization, therefore the accuracy of the data could not be validated.

The accident event was identified from the recording date and with the airplane on the ground at Half Moon Bay at a starting time of 1538:34. The last couple of minutes of data points indicated a northeasterly track at GPS derived groundspeeds around 150 knots. At 1558:14, the airplane began to descend with varied groundspeeds, and the final data point at 1558:22 was 212 knots at 854 feet.

### Radar Track

A review of recorded data was completed, and plotted on a Google Earth map display. The radar data and plots of two tracks with a secondary beacon code of 1200 (visual flight rules) are in the public docket for this accident. The target for one track switched to code 7700.

All altitudes are the transponder mode C reported altitudes. FAA Advisory Circular AC 43-6C discusses altitude reporting equipment and transponder system maintenance and inspection practices. Paragraph 9.c. (2) states that an altimeter should display an altitude within 20 feet of a calibrated reference altimeter set to 29.92 inches of mercury. Paragraph 9.d states that the altitude reporting equipment associated with a radar beacon transponder should transmit data within 125 feet of the indicated datum of the altimeter normally used to maintain flight altitude.

At 1556:39, a target (arbitrarily identified in this report as target 1) was in the middle of San Raphael Bay and left of Red Rock Island at 1,800 feet; it maintained 1,800 feet until 1557:21. The target maintained 1,900 feet from 1557:25 until 1558:02. Another target (arbitrarily identified in this report as target 2) was south of Red Rock Island, and heading to the right side of San Raphael Bay at 1,500 feet. At 1557:11, target 2 was to the right side of San Raphael Bay and right of Red Rock Island at 1,300 feet.

At 1557:39, target 2 was maintaining 1,300 feet, and approaching the path of target 1. Target 2 appeared to cross the path of target 1 at 1557:44 at 1,300 feet and south of The Brothers Island off Point San Pablo. It appeared to be left of target 1's path at 1557:48 at 1,400 feet.

The targets began to merge; at 1557:53, there were targets at 1,900 and 1,400 feet. At 1557:58, there were targets at 1,900 and 1,500 feet. A target at 1558:02 was at 1,900 feet; a target at 1558:07 was at 1,700 feet; and a target at 1558:11 was at 1,800 feet. A target at 1558:16 was at 2,000 feet, this target appeared to descend to 1,800 feet as it continued northeast bound, and changed to a secondary beacon

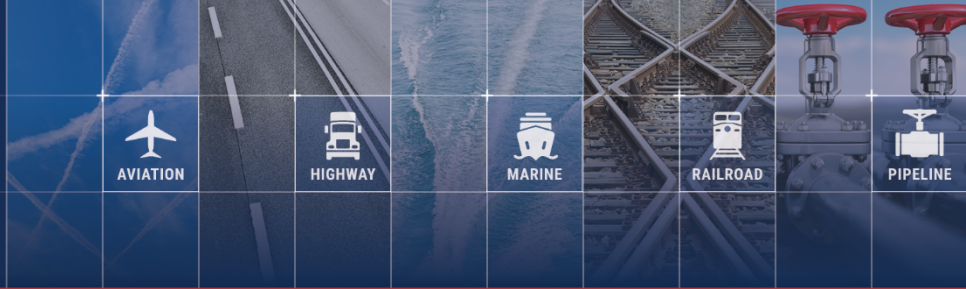
code of 7700.

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Plagens, Howard
<b>Additional Participating Persons:</b>	Tim Jarrard; FAA FSDO; Oakland, CA Henry Soderlund; Textron Aviation; Wichita, KS Nicole Charnon; Continental Motors Inc.; Mobile, AL
<b>Original Publish Date:</b>	July 12, 2016
<b>Last Revision Date:</b>	
<b>Investigation Class:</b>	<a href="#">Class</a>
<b>Note:</b>	The NTSB traveled to the scene of this accident.
<b>Investigation Docket:</b>	<a href="https://data.nts.gov/Docket?ProjectID=89120">https://data.nts.gov/Docket?ProjectID=89120</a>

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, “accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties ... and are not conducted for the purpose of determining the rights or liabilities of any person” (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB’s statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available [here](#).



# Aviation Investigation Final Report

---

<b>Location:</b>	Richmond, California	<b>Accident Number:</b>	WPR14FA174
<b>Date &amp; Time:</b>	April 27, 2014, 16:06 Local	<b>Registration:</b>	N20SF
<b>Aircraft:</b>	Hawker SEA FURY TMK 20	<b>Aircraft Damage:</b>	Substantial
<b>Defining Event:</b>	Midair collision	<b>Injuries:</b>	2 None
<b>Flight Conducted Under:</b>	Part 91: General aviation - Personal		

---

## Analysis

The Sea Fury pilot and the Cessna pilot had flown their airplanes to a nearby airport to display them at an open house. The two pilots then briefed the return flights with each other and determined their flight routes. The Sea Fury departed, flew over the airport, and rendezvoused with another airplane for a photo shoot. They flew several 360-degree patterns, and the Sea Fury pilot observed the Cessna during one of his turns, and noted that it was on the briefed course. He completed the photo work and set his course for the return to their home airport.

The Sea Fury pilot made radio contact with the Cessna pilot on a common, briefed frequency, and the Cessna pilot responded with his position. The Sea Fury pilot made visual contact with the Cessna forward and to the left, and the Cessna pilot responded that he had visual contact of the Sea Fury. The Cessna's airspeed was about 150 knots, and the Sea Fury's airspeed was about 200 knots. Approaching from well behind, the Sea Fury pilot advised the Cessna pilot that the Sea Fury was low and to the left. The Cessna pilot acknowledged visual contact again and broadcast that he wanted to take a picture. The Sea Fury pilot replied that there would probably not be time due to the speed differential. The Sea Fury pilot observed the trajectory and flight profile of the Cessna abruptly change to a left roll so that he could see the top of the Cessna's wing. The Sea Fury pilot attempted to avoid the Cessna by pitching his airplane nose down; however, he felt and heard a thump and realized that the two airplanes had collided. He pulled up and looked over his shoulder; he observed the Cessna inverted and going down. He squawked code 7700 on the transponder, and, due to communications issues, reported the midair collision and position of the Cessna to air traffic control via relay by another aircraft pilot.

The Sea Fury pilot initiated a climb, and conducted a controllability check; he determined that he could control the airplane in the current configuration. He continued to his home airport and made a successful full-stop landing.

The Sea Fury pilot stated that there were no mechanical malfunctions or failures with the airplane that would have precluded normal operation. Examination of the Sea Fury and the recovered portions of the

Cessna did not reveal any anomalies that would have precluded normal operation of the airplanes.

The last couple of minutes of data points from a GPS unit in the Cessna indicated a northeasterly track at GPS-derived groundspeeds of about 150 knots. The last few data points indicated that the airplane began to descend with varied groundspeeds, and the final data point was 212 knots at 854 ft. A review of recorded radar data showed two targets with one target approaching from behind and low. As the targets merged, the data points could not be attributed to either airplane because they were within the accuracy limits of the transmitting/recording systems.

## Probable Cause and Findings

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

Both pilots' failure to maintain adequate clearance from each other during cruise flight while in visual contact with each other. Contributing to the accident was the unexpected abrupt maneuver made by the other pilot.

### Findings

<b>Personnel issues</b>	Monitoring other aircraft - Pilot
<b>Personnel issues</b>	(general) - Pilot of other aircraft
<b>Personnel issues</b>	Monitoring other aircraft - Pilot of other aircraft

## Factual Information

### History of Flight

#### Maneuvering

#### Midair collision

On April 27, 2014, about 1606 Pacific daylight time, a Cessna 210E, N4962U, and a Hawker Sea Fury TMK 20, N20SF, collided in flight near Richmond, California. Sanders Aircraft, Inc., was operating both airplanes under the provisions of Title 14 Code of Federal Regulations (CFR) Part 91. The private pilot in the Cessna sustained fatal injuries; the commercial pilot and one passenger in the Sea Fury were not injured. The Cessna was destroyed during the accident sequence, and the Sea Fury sustained substantial damage to the empennage. Both cross-country personal flights departed Half Moon Bay, California; the Sea Fury departed about 1530, and the Cessna departed about 1538. Both airplanes were en route to Eagle's Nest Airport, Ione, California. Visual meteorological conditions prevailed, and no flight plans had been filed.

The National Transportation Safety Board (NTSB) investigator-in-charge (IIC) interviewed the Sea Fury pilot, and the operator submitted a Pilot/Operator accident report, NTSB form 6120.1. The Sea Fury pilot and the Cessna pilot had flown their airplanes to Half Moon Bay to display them at an open house for the airport. The two pilots briefed the flight home, and determined their route of flight. The Sea Fury departed, flew overhead the airport, and rendezvoused with a Beechcraft A36 Bonanza for a photo shoot over the Golden Gate Bridge in San Francisco, California. They flew several 360 degree patterns over the bridge, and the pilot observed the Cessna during one of his turns, and noted that it was on the briefed course. He completed the photo work, and set his course for the return to Ione.

The Sea Fury pilot made radio contact with the Cessna pilot on a common, previously briefed frequency, and the Cessna pilot responded with his position. The Sea Fury pilot made visual contact with the Cessna, which was forward and to the left of his position, and the Cessna pilot responded that he had visual contact of the Sea Fury. The operator reported that the Cessna's airspeed was approximately 150 knots, and the airplane was under 3,000 feet msl. The Sea Fury's airspeed was approximately 200 knots, and the airplane was under 3,000 feet msl. The Sea Fury pilot stated that he would pass the Cessna low and to the left.

Approaching from well behind, the Sea Fury pilot advised the Cessna pilot that the Sea Fury was low and to the left. The Cessna pilot acknowledged visual contact again, and broadcasted that he wanted to take a picture. The Sea Fury pilot replied that there would probably not be time due to the speed differential. The Sea Fury pilot observed the trajectory and flight profile of the Cessna abruptly change to a left roll so that he could see the top of the Cessna's wing. The Sea Fury pilot attempted to evade by pitching his airplane nose down; however, he felt and heard a thump, and realized that the two airplanes had collided. He pulled up and looked over his shoulder; he observed the Cessna inverted and going down. He squawked code 7700 on the transponder, and due to communications issues, reported the mid-air and position of the Cessna to air traffic control via relay by another aircraft.

The Sea Fury pilot concentrated on flying his airplane. He initiated a climb, and conducted a

controllability check; he determined that he could control the airplane in the current configuration. He wanted to avoid populated areas, so he continued toward his home airport. He contacted company personnel, who decided to fly another company airplane to meet him, and examine the Sea Fury's condition. The Sea Fury pilot lowered the landing gear, and did a controllability check, which included turns. He lowered the flaps, and repeated the testing. He reduced airspeed to a landing compatible speed of 130 mph, and checked controllability again; he determined that he had adequate control to land. He had to abort the first landing attempt at his home airport due to emergency equipment on the runway; he made a full stop landing on runway 19 on the second attempt.

## Pilot Information

<b>Certificate:</b>	Commercial	<b>Age:</b>	52, Male
<b>Airplane Rating(s):</b>	Single-engine land; Multi-engine land	<b>Seat Occupied:</b>	Front
<b>Other Aircraft Rating(s):</b>	None	<b>Restraint Used:</b>	3-point
<b>Instrument Rating(s):</b>	Airplane	<b>Second Pilot Present:</b>	No
<b>Instructor Rating(s):</b>	None	<b>Toxicology Performed:</b>	No
<b>Medical Certification:</b>	Class 2 With waivers/limitations	<b>Last FAA Medical Exam:</b>	April 16, 2014
<b>Occupational Pilot:</b>	No	<b>Last Flight Review or Equivalent:</b>	October 1, 2012
<b>Flight Time:</b>	5646 hours (Total, all aircraft), 143 hours (Total, this make and model), 4953 hours (Pilot In Command, all aircraft), 22 hours (Last 90 days, all aircraft), 3 hours (Last 30 days, all aircraft), 1 hours (Last 24 hours, all aircraft)		

### Cessna 210 Pilot

The operator reported that the 33-year-old pilot held a private pilot certificate with a rating for airplane single-engine land. The pilot held a third-class medical certificate that was issued on February 28, 2012, with no limitations or waivers. The pilot also had an airframe and powerplant mechanic's certificate.

The operator reported that the pilot had a total flight time of 285 hours. He logged 6 hours in the last 90 days, and 2 in the previous 30 days. He had an estimated 37 hours in this make and model. He completed a flight review on July 26, 2012.

### Sea Fury Pilot

The 52-year-old pilot reported that he held a commercial pilot certificate with ratings for airplane single-engine land, multiengine land, and instrument airplane. He held a second-class medical certificate issued on April 16, 2014, with the limitation that he must have reading glasses. He had an airframe and powerplant mechanic's certificate.

The operator reported a total flight experience of 5,646 hours, and a total of 143 flight hours in the accident airplane make and model. He completed a flight review on October 1, 2012.

## Aircraft and Owner/Operator Information

<b>Aircraft Make:</b>	Hawker	<b>Registration:</b>	N20SF
<b>Model/Series:</b>	SEA FURY TMK 20	<b>Aircraft Category:</b>	Airplane
<b>Year of Manufacture:</b>	1956	<b>Amateur Built:</b>	
<b>Airworthiness Certificate:</b>	Experimental (Special)	<b>Serial Number:</b>	ES-9505
<b>Landing Gear Type:</b>	Retractable - Tailwheel	<b>Seats:</b>	2
<b>Date/Type of Last Inspection:</b>	August 1, 2013 Annual	<b>Certified Max Gross Wt.:</b>	11188 lbs
<b>Time Since Last Inspection:</b>		<b>Engines:</b>	1 Reciprocating
<b>Airframe Total Time:</b>	6378 Hrs as of last inspection	<b>Engine Manufacturer:</b>	Pratt & Whitney
<b>ELT:</b>	Not installed	<b>Engine Model/Series:</b>	R4360
<b>Registered Owner:</b>	SANDERS AIRCRAFT INC	<b>Rated Power:</b>	3800 Horsepower
<b>Operator:</b>	SANDERS AIRCRAFT INC	<b>Operating Certificate(s) Held:</b>	None

### Cessna 210E

The airplane had a high wing with a single-engine; it was serial number 21058662. The operator reported that the airplane had a total airframe time of 6,384 hours at the most recent annual inspection dated September 10, 2013.

The engine was a Continental Motors Inc. (CMI) IO-520A, serial number 112377R. The operator reported that the time since major overhaul was 468 hours.

### Sea Fury

The airplane had a low wing with a single engine; it was serial number ES9505. The operator reported that the airplane had a total airframe time of 6,378 hours at the most recent annual inspection dated August 1, 2013.

The engine was a Pratt & Whitney R4360, serial number PS15867A. The operator reported that the time since major overhaul was 85.2 hours.

## Meteorological Information and Flight Plan

<b>Conditions at Accident Site:</b>	Visual (VMC)	<b>Condition of Light:</b>	Day
<b>Observation Facility, Elevation:</b>	KOAK	<b>Distance from Accident Site:</b>	
<b>Observation Time:</b>	15:53 Local	<b>Direction from Accident Site:</b>	
<b>Lowest Cloud Condition:</b>	Few / 1700 ft AGL	<b>Visibility</b>	10 miles
<b>Lowest Ceiling:</b>	Broken / 11000 ft AGL	<b>Visibility (RVR):</b>	
<b>Wind Speed/Gusts:</b>	15 knots /	<b>Turbulence Type Forecast/Actual:</b>	/ None
<b>Wind Direction:</b>	260°	<b>Turbulence Severity Forecast/Actual:</b>	/ N/A
<b>Altimeter Setting:</b>	30.09 inches Hg	<b>Temperature/Dew Point:</b>	17°C / 8°C
<b>Precipitation and Obscuration:</b>	No Obscuration; No Precipitation		
<b>Departure Point:</b>	Half Moon Bay, CA (HAF )	<b>Type of Flight Plan Filed:</b>	None
<b>Destination:</b>	Ione, CA (CA20)	<b>Type of Clearance:</b>	None
<b>Departure Time:</b>	15:30 Local	<b>Type of Airspace:</b>	

An aviation routine weather report (METAR) for Oakland (KOAK), California, (elevation 9 feet, 11 nautical miles (nm) southeast of the accident site) was issued at 1553 PDT. It stated: wind from 260 degrees at 15 knots; visibility 10 miles; few clouds at 1,700 feet; temperature 17/63 degrees C/F; dew point 8/46 degrees C/F; altimeter 30.09 inches of mercury.

## Airport Information

<b>Airport:</b>	Eagles Nest CA20	<b>Runway Surface Type:</b>	
<b>Airport Elevation:</b>	220 ft msl	<b>Runway Surface Condition:</b>	Unknown
<b>Runway Used:</b>		<b>IFR Approach:</b>	None
<b>Runway Length/Width:</b>		<b>VFR Approach/Landing:</b>	None

## Wreckage and Impact Information

<b>Crew Injuries:</b>	1 None	<b>Aircraft Damage:</b>	Substantial
<b>Passenger Injuries:</b>	1 None	<b>Aircraft Fire:</b>	None
<b>Ground Injuries:</b>	N/A	<b>Aircraft Explosion:</b>	None
<b>Total Injuries:</b>	2 None	<b>Latitude, Longitude:</b>	37.984165,-122.414169(est)

Detailed reports on follow-up examinations of both airplanes are part of the public docket for this



accident, and can be accessed by the Accident Docket link on the ntsb.gov home page.

## Cessna 210

The Cessna 210 came to rest in about 10 feet of water in San Pablo Bay near Richmond, and the wreckage was retrieved on April 30. The recovered wreckage consisted of the fuselage and the engine. Neither wing was recovered. The propeller separated from the crankshaft, and was not located.

## Sea Fury

The Sea Fury landed at its home base.

The Sea Fury was silver with dark blue and red accents. The Cessna had blue wingtips; it also had blue paint on the leading edge of both wings, on top of the cowling, and along the sides of the fuselage.

The IIC and an inspector from the Federal Aviation Administration examined the Sea Fury. The top remaining portion of the vertical stabilizer was crushed aft and down with blue paint transfer marks on the aft portion of the remaining metal. The operator reported that the missing vertical stabilizer section was about 12 inches long. The rudder had crush damage. The right elevator separated outboard of the middle hinge; about 2 feet of the elevator was missing. About 3 feet of the outboard section of the right horizontal stabilizer was missing. The outboard fracture surface was jagged and angular, and the upper surface had crushed inboard in an accordion fashion. Investigators observed blue paint transfer marks and scratches on the upper skin surface and within the folds of the metal. The scratches were a few degrees (outboard to inboard) from alignment with the longitudinal axis of the airframe.

The bottom of the right horizontal stabilizer had two slash cuts that were similar in shape to a propeller blade; the cuts were almost perpendicular to the chord line. The marks were 10 inches apart from trailing edge to trailing edge, and 4 inches wide near their end point (tip). The metal was pushed up into the horizontal stabilizer cavity, and had black paint transfer on the metal surfaces. The forward cut was through both the bottom and top skins, and the edges of the cut in the top skin were curled up.

## Medical and Pathological Information

---

An autopsy was conducted by Contra Costa County Office of the Sheriff- Coroner. The cause of death was reported as multiple blunt force injuries.

Toxicological tests on specimens recovered from the Cessna 210 pilot were performed by the FAA Civil Aerospace Medical Institute Forensic Toxicology Research Team. Analysis of the specimens for the pilot contained no findings for volatiles or tested drugs. They did not perform tests for carbon monoxide or cyanide.

## Tests and Research

---

Investigators examined the recovered wreckage of the Cessna 210 at Plain Parts, Sacramento, California, on May 6, 2014. A full report is contained within the public docket for this accident, and is accessible via the Accident Docket link on the ntsb.gov home page.

### Airframe

Only the inboard portion of the left wing spar was recovered, and continuity could not be established for the ailerons. Continuity was established for the elevators and rudder.

The airframe manufacturer's investigator determined that the landing gear was in the up position. The flap actuator was not recovered; the indicator was full down, but the handle was in a neutral position. The investigator determined that the elevator trim was in the neutral position.

### Engine

The engine separated during the accident sequence. The front and left side of the engine sustained the most damage; cylinder number six's front fins were crushed aft, the exhaust valve spring was missing, the exhaust valve was bent aft, and the associated portion of the rocker shaft was missing. The fracture surface on the remaining portion of rocker shaft was jagged and angular. The intake push rod for cylinder number five was severely bent.

The crankshaft was manually rotated with a drive bar on the propeller mounting bolts. The crankshaft rotated with some resistance; and the valves for cylinders one, two, three, and four moved approximately the same amount of lift. The gears in the accessory case turned freely. Thumb compression was obtained on cylinders one, two, three, and four.

The spark plug electrodes corresponded to normal operation according to the Champion Aviation Check-A-Plug AV-27 Chart. Several plugs were caked with mud.

A borescope inspection revealed no mechanical deformation on the valves, cylinder walls, or internal cylinder head.

The propeller flange was bent adjacent to the serial number, and the crankshaft cracked aft of the flange on the opposite side.

The engine driven fuel pump drive gear was undamaged, and the pump rotated freely. The gascolator screen was clean; there was some contamination in the bowl, and white, bubbly discoloration was evident. The metering unit of the throttle body was not recovered. The throttle body screen was clean. The mixture shaft rotated freely from stop to stop; the throttle shaft rotated freely.

The oil pump had light scoring on the internal walls; no deformation was observed on the gears.

## Additional Information

---

### Cessna 210 GPS Data Extraction

A Garmin GPSMAP 496 battery powered portable unit was recovered from the wreckage. The unit sustained crush and water damage, but the NTSB Recorders Laboratory used forensic equipment to successfully extract data from the nonvolatile memory chip. A complete report is part of the public docket for this accident. The IIC converted all times to PDT. The Garmin GPSMAP 496 was WAAS enabled, which can increase the accuracy of the GPS data by using ground stations to correct the signal; however, the recorded data lacked information regarding satellite signal quality and ground station utilization, therefore the accuracy of the data could not be validated.

The accident event was identified from the recording date and with the airplane on the ground at Half Moon Bay at a starting time of 1538:34. The last couple of minutes of data points indicated a northeasterly track at GPS derived groundspeeds around 150 knots. At 1558:14, the airplane began to descend with varied groundspeeds, and the final data point at 1558:22 was 212 knots at 854 feet.

### Radar Track

A review of recorded data was completed, and plotted on a Google Earth map display. The radar data and plots of two tracks with a secondary beacon code of 1200 (visual flight rules) are in the public docket for this accident. The target for one track switched to code 7700.

All altitudes are the transponder mode C reported altitudes. FAA Advisory Circular AC 43-6C discusses altitude reporting equipment and transponder system maintenance and inspection practices. Paragraph 9.c. (2) states that an altimeter should display an altitude within 20 feet of a calibrated reference altimeter set to 29.92 inches of mercury. Paragraph 9.d states that the altitude reporting equipment associated with a radar beacon transponder should transmit data within 125 feet of the indicated datum of the altimeter normally used to maintain flight altitude.

At 1556:39, a target (arbitrarily identified in this report as target 1) was in the middle of San Raphael Bay and left of Red Rock Island at 1,800 feet; it maintained 1,800 feet until 1557:21. The target maintained 1,900 feet from 1557:25 until 1558:02. Another target (arbitrarily identified in this report as target 2) was south of Red Rock Island, and heading to the right side of San Raphael Bay at 1,500 feet. At 1557:11, target 2 was to the right side of San Raphael Bay and right of Red Rock Island at 1,300 feet.

At 1557:39, target 2 was maintaining 1,300 feet, and approaching the path of target 1. Target 2 appeared to cross the path of target 1 at 1557:44 at 1,300 feet and south of The Brothers Island off Point San Pablo. It appeared to be left of target 1's path at 1557:48 at 1,400 feet.

The targets began to merge; at 1557:53, there were targets at 1,900 and 1,400 feet. At 1557:58, there were targets at 1,900 and 1,500 feet. A target at 1558:02 was at 1,900 feet; a target at 1558:07 was at 1,700 feet; and a target at 1558:11 was at 1,800 feet. A target at 1558:16 was at 2,000 feet, this target appeared to descend to 1,800 feet as it continued northeast bound, and changed to a secondary beacon code of 7700.

## Administrative Information

<b>Investigator In Charge (IIC):</b>	Plagens, Howard
<b>Additional Participating Persons:</b>	Tim Jarrard; FAA FSDO; Oakland, CA Henry Soderlund; Textron Aviation; Wichita, KS Nicole Charnon; Continental Motors Inc.; Mobile, AL
<b>Original Publish Date:</b>	July 12, 2016
<b>Last Revision Date:</b>	
<b>Investigation Class:</b>	<a href="#">Class</a>
<b>Note:</b>	The NTSB traveled to the scene of this accident.
<b>Investigation Docket:</b>	<a href="https://data.nts.gov/Docket?ProjectID=89120">https://data.nts.gov/Docket?ProjectID=89120</a>

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, “accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties ... and are not conducted for the purpose of determining the rights or liabilities of any person” (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB’s statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available [here](#).