

INVESTIGATIVE MATERIAL SUPPLEMENT

HISTORY OF FLIGHT

On February 19, 2021, about 1158, a Piper PA-32-260 Cherokee Six airplane, N57014, was substantially damaged when it was involved in an accident in Los Angeles, California. The pilot was fatally injured and a person on the ground sustained minor injuries. The airplane was operated as a Title 14 *Code of Federal Regulations* (CFR) Part 91 personal flight.

Investigators reviewed flight track data covering the area of the accident during the time surrounding the accident using Federal Aviation Administration (FAA) provided Automatic Dependent Surveillance-Broadcast (ADS-B) data. The airplane had been assigned a discrete transponder code of 0242 by the FAA's Southern California Terminal Radar Approach Control (SCT TRACON). The data was consistent with the airplane departing Torrance at 1146 and proceeding south-southeast along the coastline while climbing, reaching an altitude of about 3,400 ft mean sea level (msl).

The pilot was in communication with SCT air traffic controllers during the flight receiving visual flight rules (VFR) flight following. At 1155:29, the pilot reported to the SCT Harbor radar controller that he was experiencing engine problems. After the controller queried about the nature of the problem, at 1156:30 the pilot stated, "I have an engine wobble; no RPM's." About 20 seconds later, the pilot added, "I think I have to make an off-airport landing." Several seconds later he transmitted his final communication that the Long Beach harbor appeared to be the best place to land and that "I am going to see if I can make it." The radar indicated that the airplane proceeded toward Terminal Island and aligned for an emergency landing to a paved area.

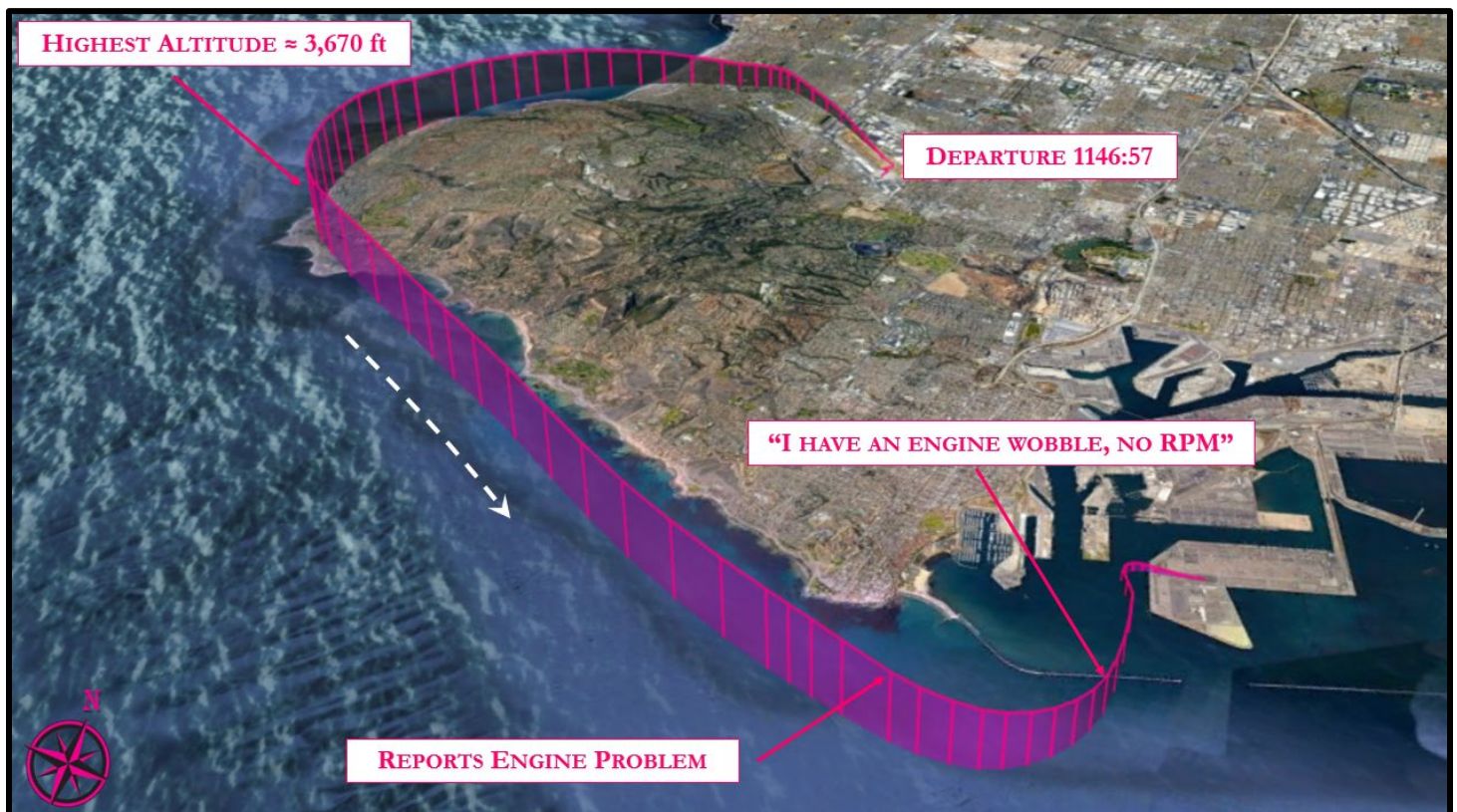


Figure 1: Accident Flight Path

Video footage was obtained from numerous security cameras at the terminal. A review of the footage revealed that the airplane descended configured in a relatively flat pitch attitude. The left wing collided with a semi-truck

followed by the airplane impacting a concrete barrier in a left-wing low attitude. The airplane rotated over itself in a cartwheel type motion and came to rest upright.



Figure 2: Security Camera Footage (compilation prior to impact)



Figure 3: Security Camera Footage (by frame)

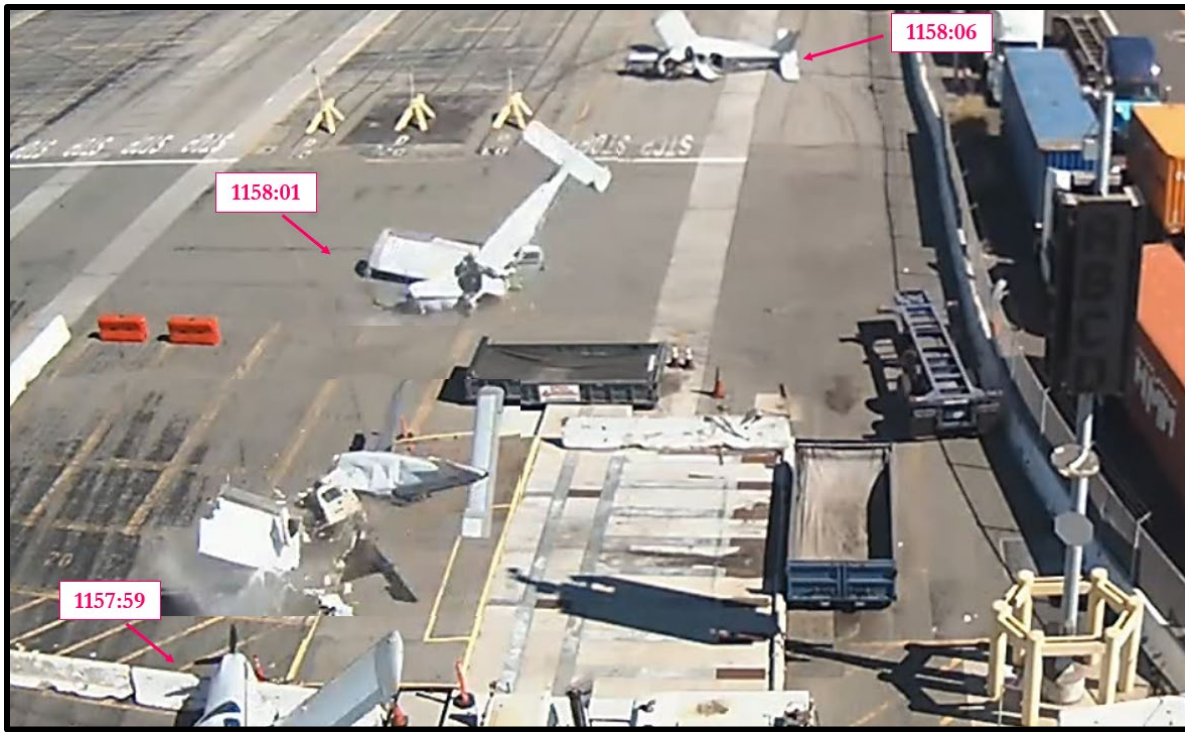


Figure 4: Security Camera Footage (compiled)



PAST FLIGHTS				
Date	Departure	Arrival	Aircraft	Duration
Friday 19-Feb-2021	11:47 PST Zamperini Fld - TOA	Last seen at 11:57 PST near Torrance, CA	PA32	0h 10m
Friday 05-Feb-2021	11:44 PST Zamperini Fld - TOA	12:54 PST Zamperini Fld - TOA	PA32	1h 10m
Tuesday 02-Feb-2021	14:09 PST Zamperini Fld - TOA	14:25 PST Zamperini Fld - TOA	PA32	0h 16m
Tuesday 02-Feb-2021	13:26 PST Zamperini Fld - TOA	13:27 PST Zamperini Fld - TOA	PA32	0h 01m

Figure 5: FlightAware Recent Flight History

WRECKAGE AND IMPACT

The accident site was located in a container shipping yards about 6.5 nautical miles (nm) southeast of Torrance at the following coordinates: 33.723995, -118.251341. The wreckage was found distributed over about 200-feet on a median magnetic bearing of about 79°.



Figure 6: Accident Site in Reference to Departure



Figure 7: Accident Site

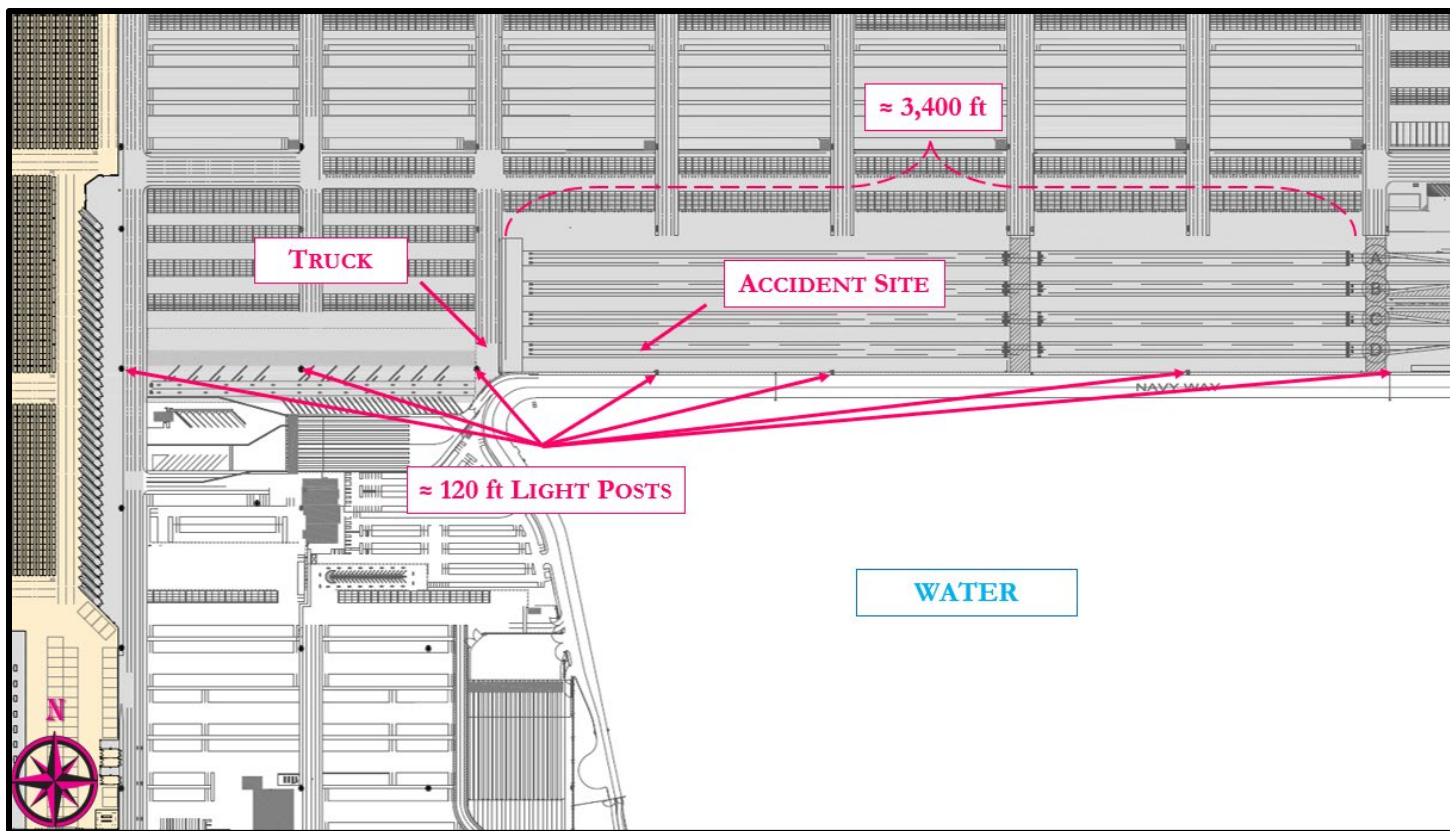


Figure 8: Diagram of Accident Site (showing light posts)

The first identified piece of debris was the outboard left wing that had come to rest in the truck cab. The hood of the truck, about 6 feet above ground level (agl), had paint transfers, consistent with the tip of the left wing contacting cab in a left-wing low attitude. Adjacent to the truck was a 120 feet tall light post, which is where security cameras were located.

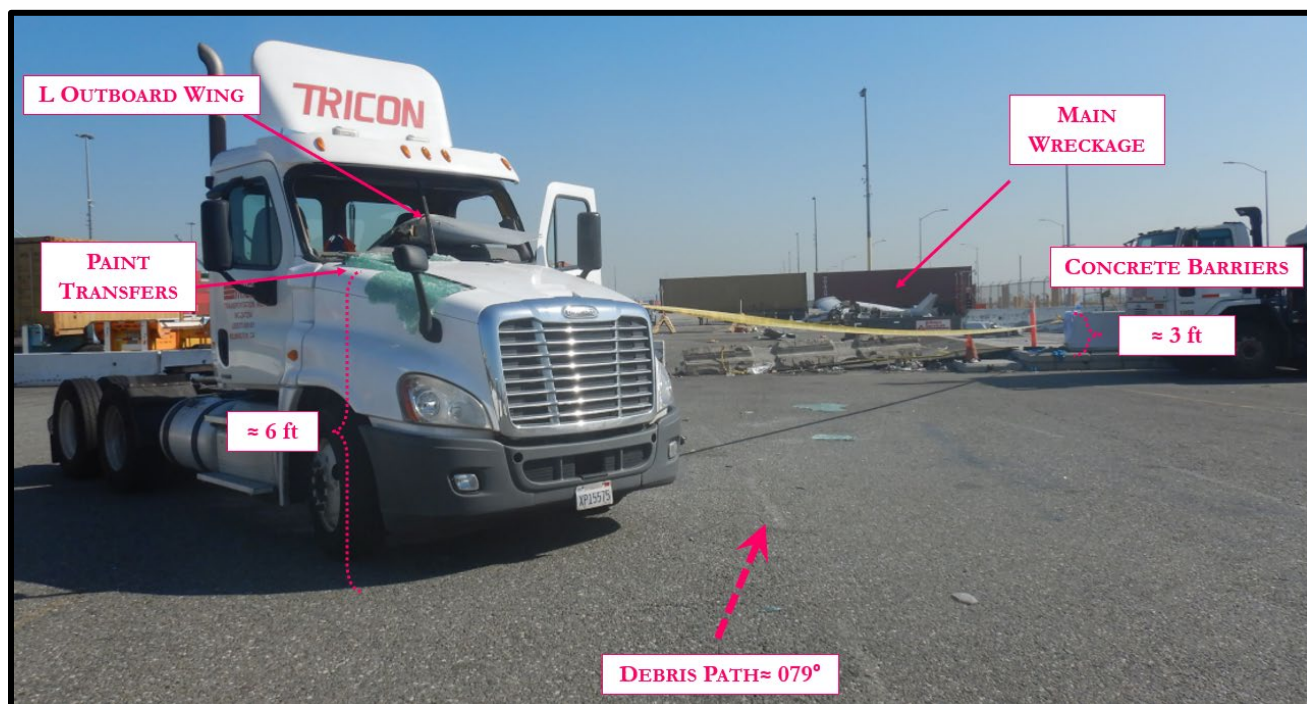


Figure 9: First Identified Point of Impact

L INBOARD WING
(WITH FLAP)

MAIN
WRECKAGE

L MID WING
(WITH AILERON)

CONCRETE BARRIERS
(PAINT TRANSFERS)

≈ 3 ft

≈ 15 ft

AIRFRAME	
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TC A350

PC 206

PIPER

MANUFACTURED BY
**PIPER AIRCRAFT
 CORPORATION**

VERNO BEAVER

MODEL **PA32-260**

SERIAL NO. **32-7400014**

LICENSED UNDER U.S. AIRPLANE
 PATENTS OF ALL MEMBERS
PIPER AIRCRAFT ASSOCIATION

N.E.A. PLATE No. **451416**

Figure 11: Airplane Data Plate

The fuselage had come to rest upright and was impact damaged the severity of which was near the pilots' seats. The left forward cabin area was fragmented and the floor skin was deformed aft.

Investigators established control continuity by manipulating a control input and observing the respective control surface move in response. The control wheels remained attached and the aileron control chain was routed over the tee bar sprockets. The left aileron control cable was continuous to the left aileron bellcrank that was separated from the left wing and had come to rest alongside the cabin. The right aileron cable was separated adjacent to the turnbuckle and have an appearance of being broom-strawed, consistent with overload; movement of the right control cable end and balance cable producing movement in the right aileron. The rudder pedal bar was deformed, and the pilot's side left pedal separated consistent with impact. The rudder cables remained attached to the pedal bar and could be traced to the rudder control horn. The stabilator control cables remained attached to the tee bar; the stabilator 'up' cable displayed a broomstraw cable separation about 2 feet from the tee bar, however the 'down' cable displayed no separations; no other cable separations were found in the stabilator control system. The flap Johnson bar handle remained mounted to the cabin floor and was found positioned to 10°.

The front left seat, the pilot's seat, was impact separated from the seat tracks and some deformation to the frame was noted. The lap belt remained anchored to structure and was buckled, with the shoulder harness end loop attached. The lap belt and shoulder harness displayed jagged cuts, consistent with first responder activity. The remaining 5 cabin seats and accompanying seat belts remained mounted to structure and appeared undamaged.

The nose baggage area and door frame were deformed. The nose baggage door remained attached to structure and was open consistent with the first responders attempting to locate and disconnect the battery. The front right cabin door remained mounted to cabin structure. The aft cabin door was separated from its hinges. The aft baggage door was in its frame, was closed, and with no visible damage.

WINGS

The left wing had separated from the fuselage at the wing root and had separated into two principal sections at about Wing Station (WS) 107. The left wing tip came to rest within the cab of the semi-truck; the fuel cap remained in place within the filler neck.

The outboard left-wing leading edge displayed an area of aft crushing with angular edges. There was crush deformation with the skin fold aft upon itself giving an accorded appearance. The aileron remained attached to the outboard wing section and was buckled with the apex of the bend midspan. The left aileron bellcrank was impact separated from the wing and remained attached to the fuselage by the control and balance cable.

The deformed inboard wing portion spanned from WS 0 to 107. The left main fuel tank remained in place within the wing and displayed some crushing and fuel staining on the exterior. The fuel cap was absent from the filler neck; it was found broken apart in the debris field closer to the concrete barriers. Residual fuel was observed in the left main tank. The impact damaged left flap remained attached to the inboard wing portion by the inboard flap support. The left main landing gear remained mounted to the wing and was displaced aft.

The right wing remained attached to the fuselage. An absorbent material has beneath the wing and stains consistent with fuel staining were observed on the asphalt below the tip tank. The right main landing gear remained mounted to the wing and appeared undamaged. The right aileron remained affixed to the wing at its respective attach points. The right flap remained attached to the wing with no apparent damage.

The inboard fuel tank showed no damage to the exterior. The fuel cap was found in place in the filler; the gasket was brittle and had cracked apart. The right tip tank fiberglass material was scraped, and fuel staining was present on the exterior. The tip tank fuel cap remained in place within the filler neck, and the cap gasket was intact. No fuel was observed in either tank.

FUEL SYSTEM

The fuel system consisted of two aluminum tanks contained in the inboard leading edge section of the wings in addition to two fiberglass tanks located in each wing tip. The main tanks have a maximum capacity of 25 gallons each while the tip tanks hold a maximum capacity of 17 gallons each. The system was designed for fuel to be taken from each tank through a screen located in the tank outlet fitting and onto a combination fuel selector valve and strainer located under the floor panel under the middle seats. The fuel selector valve is controlled remotely by a selector lever located on the sloping face of the control tunnel. The strainer portion of the valve is operated by a lever located on the right front side of the spar cover under the forward end of the right middle seat. From the selector valve, fuel is drawn through the electric fuel pump located in the area under the middle seats, through the engine driven pump and onto the carburetor.

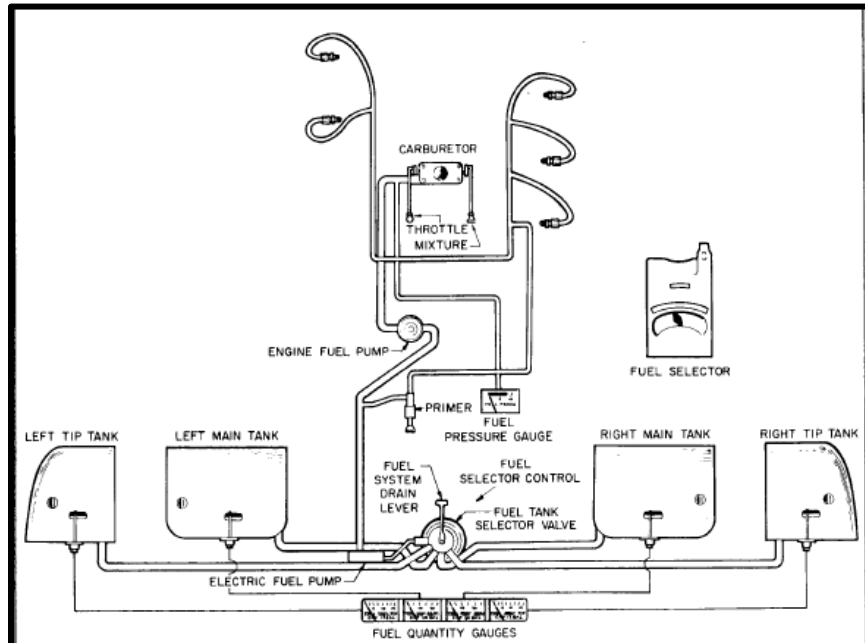


Figure 12: Fuel System

QUANTITY

The fuel receipt from the last known fueling was On February 05, equating to 14 days prior to the accident. The time stamp on the receipt was consistent with the pilot adding about 12.5 gallons of fuel prior to that flight. A notebook listing the fuel quantities indicated that there was 65.78 gallons remaining after the last flight, consistent with that being the quantity at the time of the departure.

EXAMINATION

The fuel selector handle was absent from the body consistent with impact damage. The fuel selector valve assembly remained mounted within the cabin floor and there was no evidence of mechanical malfunction or failure. The fuel lines remained installed on the fuel selector. Upon removal of the fuel selector, investigators drained several ounces of fuel from the bowl. When routing air through the outlet, investigators could establish that the air escaped from the intended tank position selected, with a tactile detent at each position. Disassembly of the bowl revealed the screen was free from any blockages.

The electric fuel pump remained mounted within the cabin floor and the external examination revealed no evidence of mechanical anomalies. The inlet line remained installed on the pump, however the copper outlet line was pulled from the "B" nut. Upon removal of the pump, investigators collected liquid in a glass jar. There was about an ounce of liquid consistent in appearance and odor with that of AVGAS. In the fuel was also a substantial amount of sediment and a submersing water-detecting paste indicated that water was additionally

present in the sample. Removal of the fuel screen revealed that it was brittle and covered in the same looking sediment and rust.

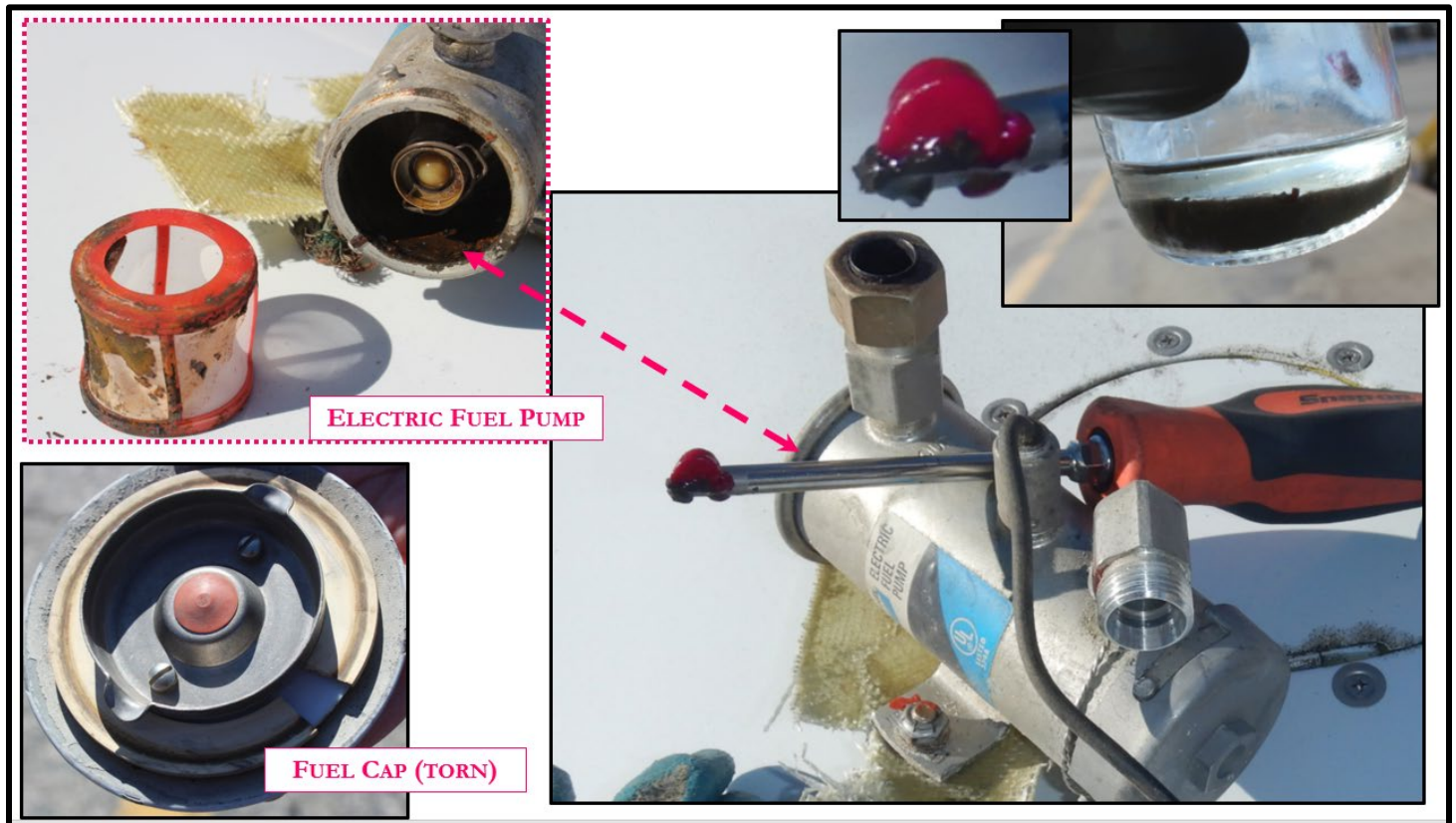


Figure 13: Electric Fuel Pump

The copper fuel line between the electric fuel pump and the firewall was fragmented and entangled in the deformed fuselage skin folds. The line was fractured from the firewall fitting and a visual inspection revealed rust on the inside walls. The hoses installed on the firewall forward in the engine compartment has bright orange torque stripes that were consistent with a recent installation. The engine driven fuel pump was removed and disassembled. The diaphragms were pliable and no anomalies were noted. The fuel line was removed at the carburetor and the liquid was collected in a glass jar; the liquid was clean and consistent in appearance and odor with that of AVGAS. The water detecting paste did not reveal evidence of water.

ENGINE

The Lycoming O-540-E4B5, serial number L-15805-40, was the original engine installed on the airplane at manufacture.



Figure 14: Engine Data plate

An external examination of the engine revealed that the oil dipstick was not secured and loosely floating in the oil filler hole with the o-ring visible. The engine case immediately adjacent to the oil filler was wetted with oil and removal of the upper cowling revealed that the underside of the oil filler door contained an oil film. The oil indicating dip stick showed 9 quarts.

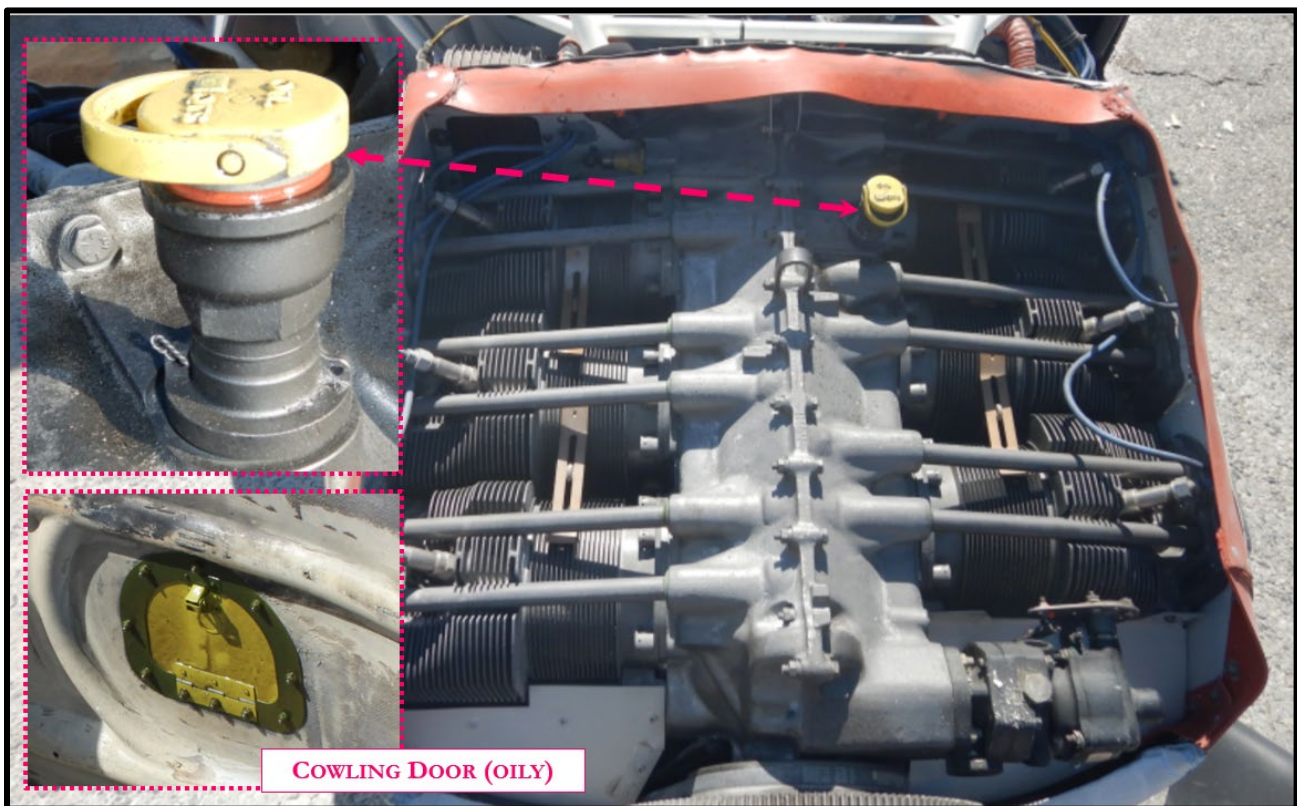


Figure 15: Oil Dipstick

Investigators established continuity from the throttle and mixture controls from the controls in the cockpit to the arms on the carburetor. The controls were located in the full forward position and after moving the friction arm (relieving the tension), manipulation of the controls moved the respective arms from stop to stop. The carburetor heat control could not be verified which was likely because the cable was bound in the nose compartment area because of impact.

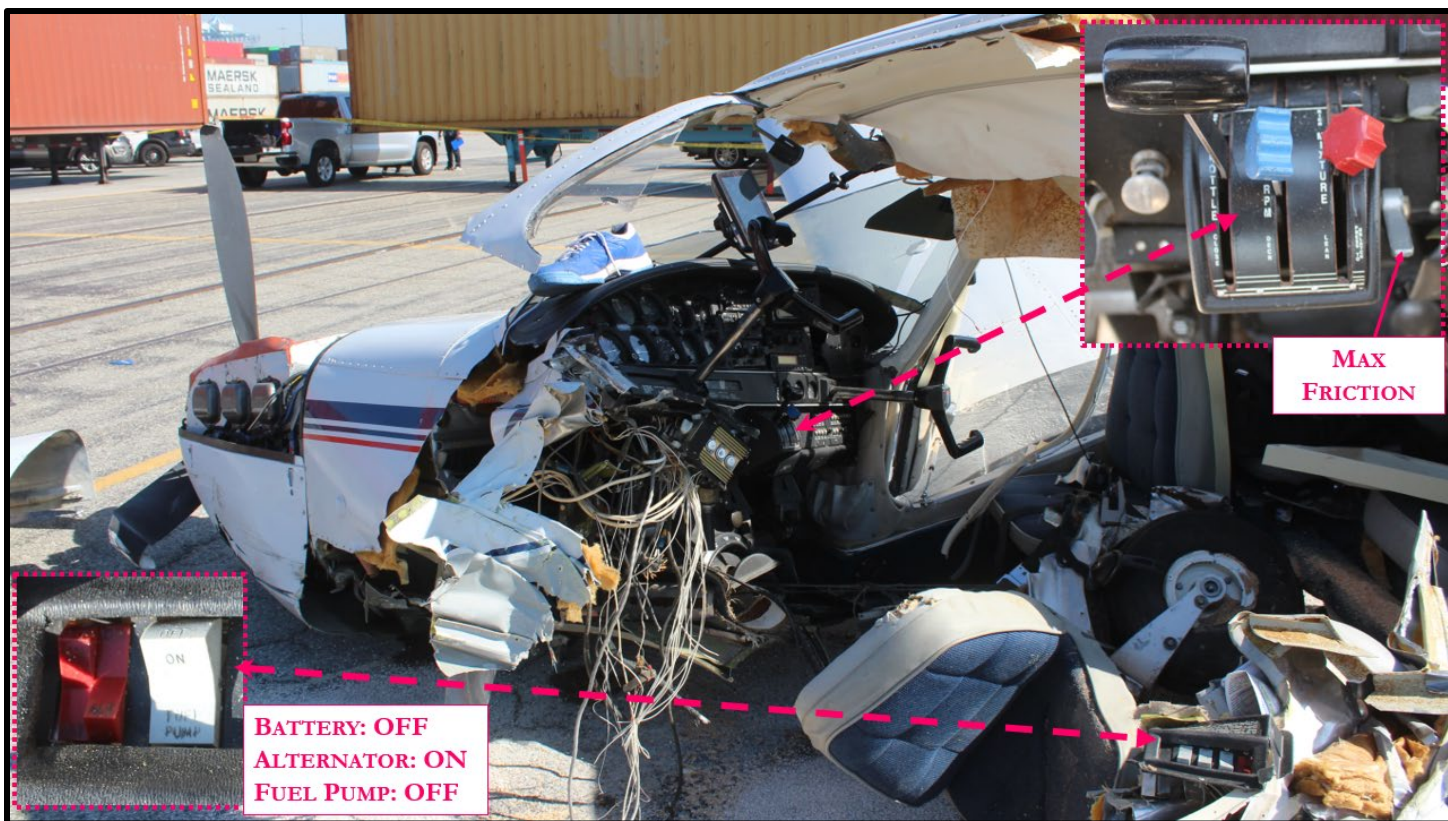


Figure 16: Throttle/Mixture/Propeller at Accident Site

The oil sump drain had penetrated the scat tube from the cabin air; oil was draining in the scat tubing to the carburetor airbox. Disassembly of the carburetor airbox revealed that the filter had sustained burn damage, consistent with a carburetor fire. The lower cowling had corresponding soot marks at the vent. The carburetor was disassembled, revealing intact plastic floats and liquid resembling Avgas in the bowl.

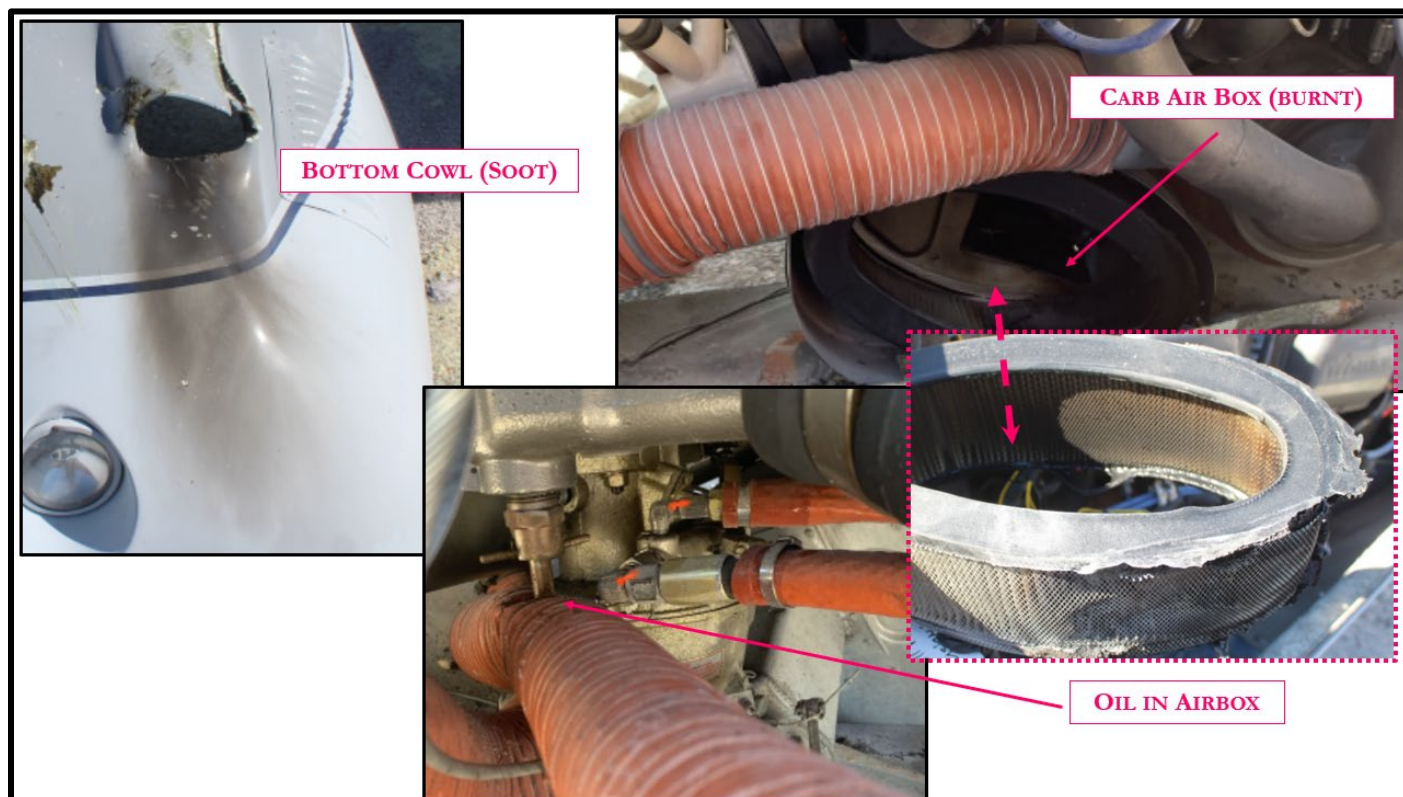


Figure 17: Carburetor Air Box and Filter

Investigators removed the upper spark plugs, all of which had an oily film and were dark. The No. 3 spark plugs did not have a gap between the post electrodes, but no damage was visible; the Nos. 4 and 1 plugs did not have a gap between the posts that would be expected. Removal of the bottom spark plugs disclosed that the Nos. 3, 4 and 6 were damaged.

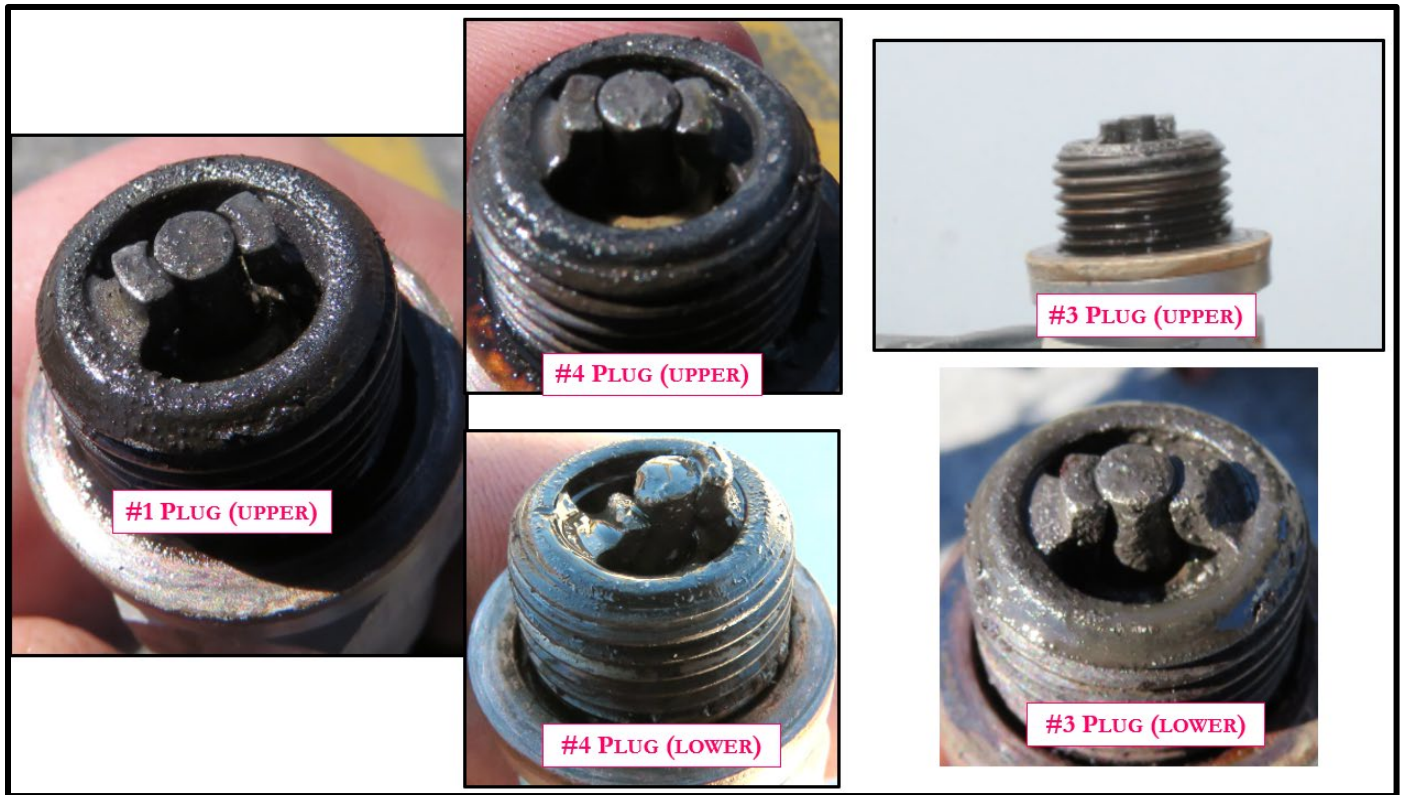


Figure 18: Upper Spark Plugs

The magneto timing was tested and found to be within the Lycoming recommendations; upon rotation of the propeller, spark was produced at each lead.

Removal of the rocker box valve covers revealed that the exhaust rotator cap on the No. 2 cylinder was loosely lying in the cover.

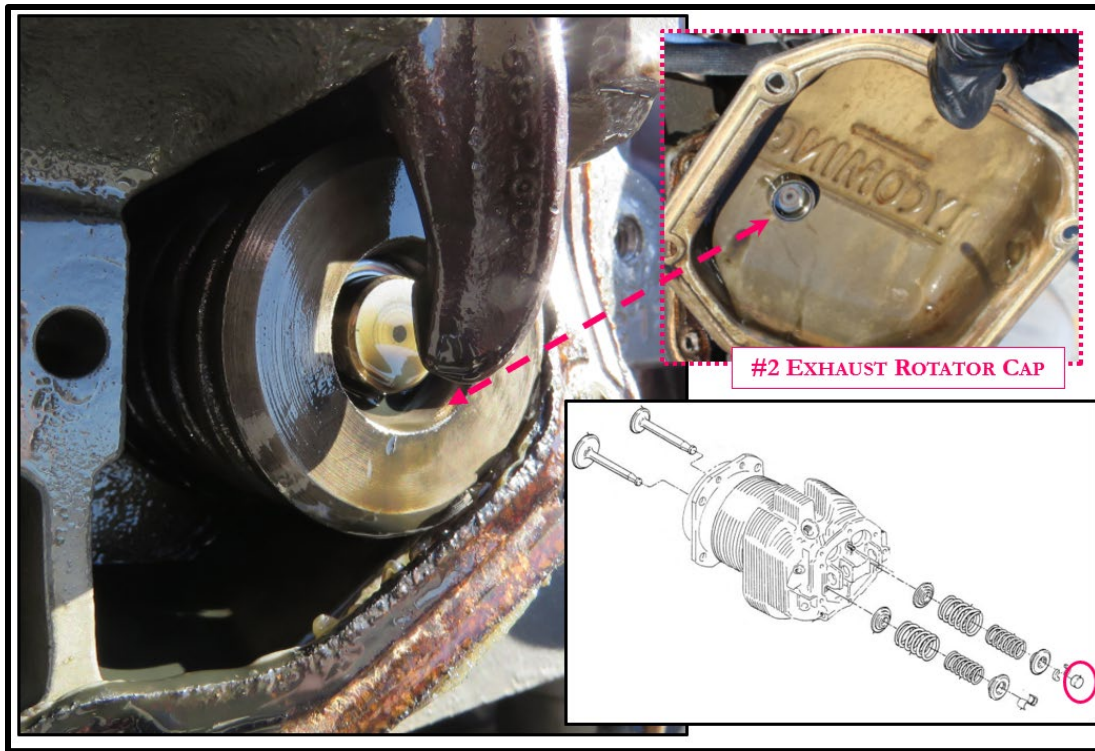


Figure 19: Cylinder No. 2 Exhaust

The exhaust valve spring on the No. 6 cylinder was protruded out at an angle with the rocker arm holding it the retainer. The exhaust pushrod was bent.

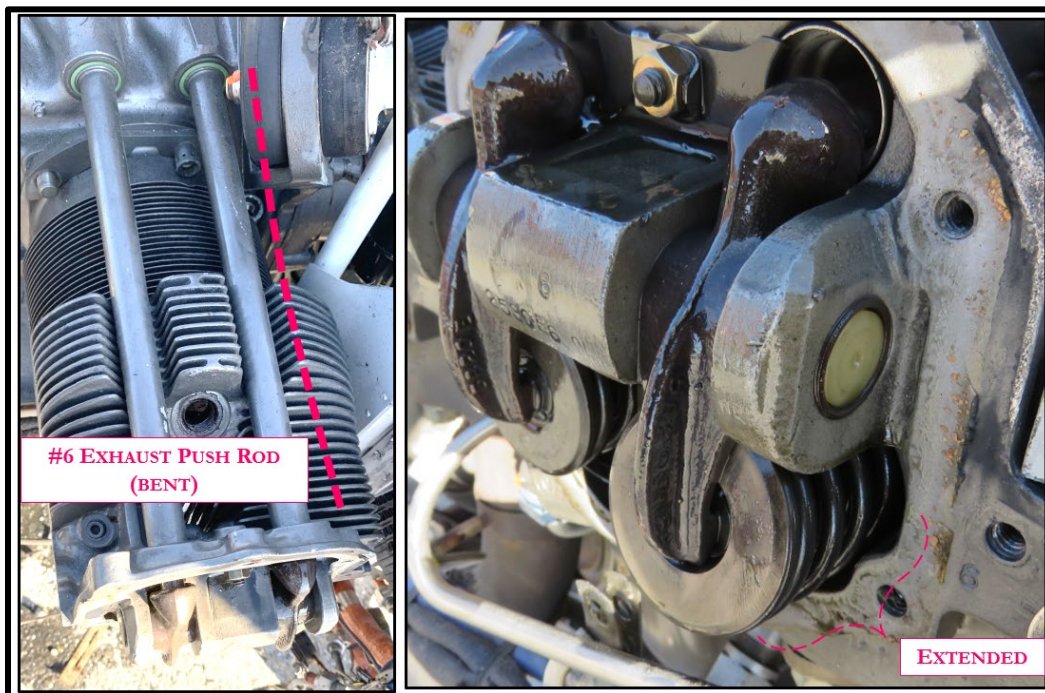


Figure 20: Cylinder No. 6

Removal of the No. 2 cylinder revealed that there was numerous pieces of metal in the engine crankcase. Removal of the No. 4 cylinder revealed that the piston face had numerous gouges consistent with metal consumption in the barrel. There were pieces of worn metal found in the intake and exhaust pipes.

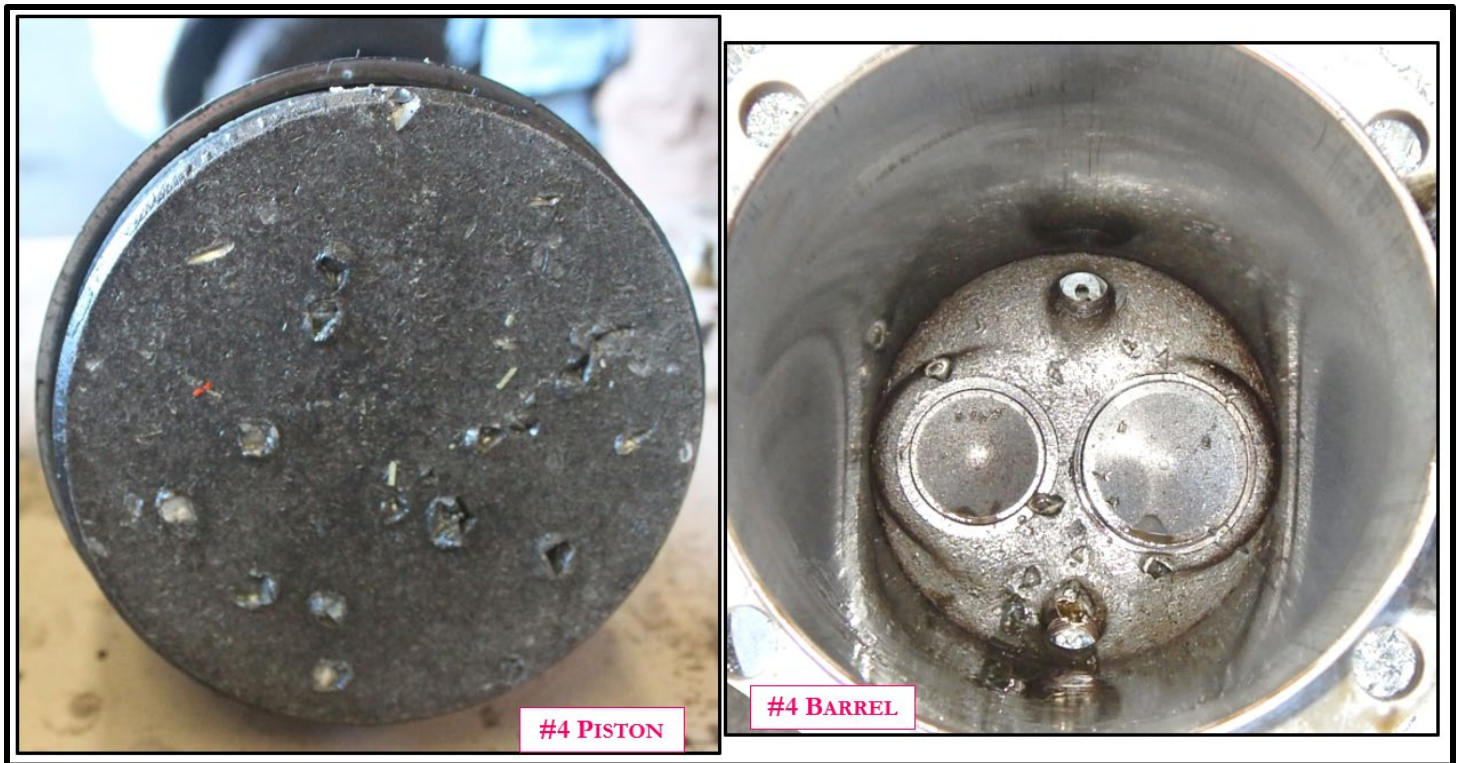


Figure 21: Cylinder No. 4

Removal of the No. 6 cylinder revealed that the upper portion of the piston was trapped forward inside the barrel and dislodged from the wrist pin. The head of the exhaust valve was dislodged and was buried into the head area adjacent to seat. The exhaust valve stem and keepers were not located. There were numerous pieces of metal were found throughout the crankcase and over a pint of metal pieces were recovered from the oil sump.

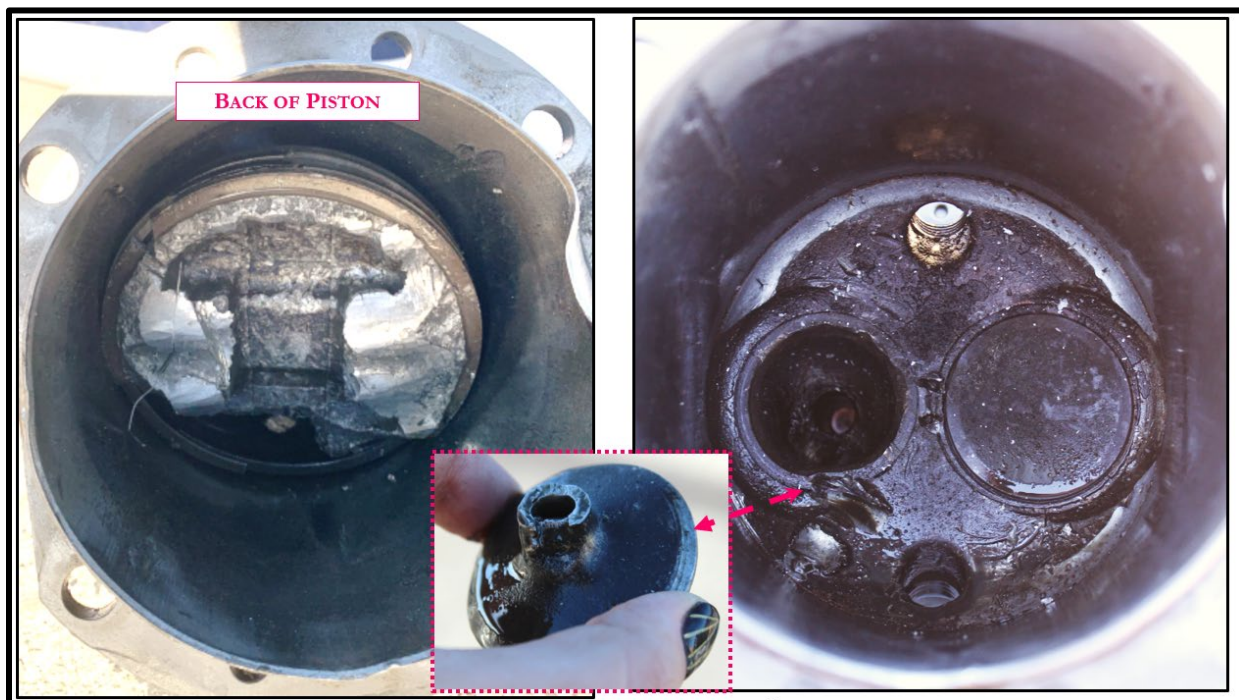


Figure 22: Cylinder No. 6

Further examination of the No. 6 cylinder revealed that the rocker arm was gouged on its surface adjacent to the engine under the rocker arm shaft. The exhaust valve spring seats (both upper and lower) had pieces broken off.

The upper spring seat was chipped where the rocker arm was resting. The base of the seat contained wear marks consistent with repetitive contact. The piston rings were not present.

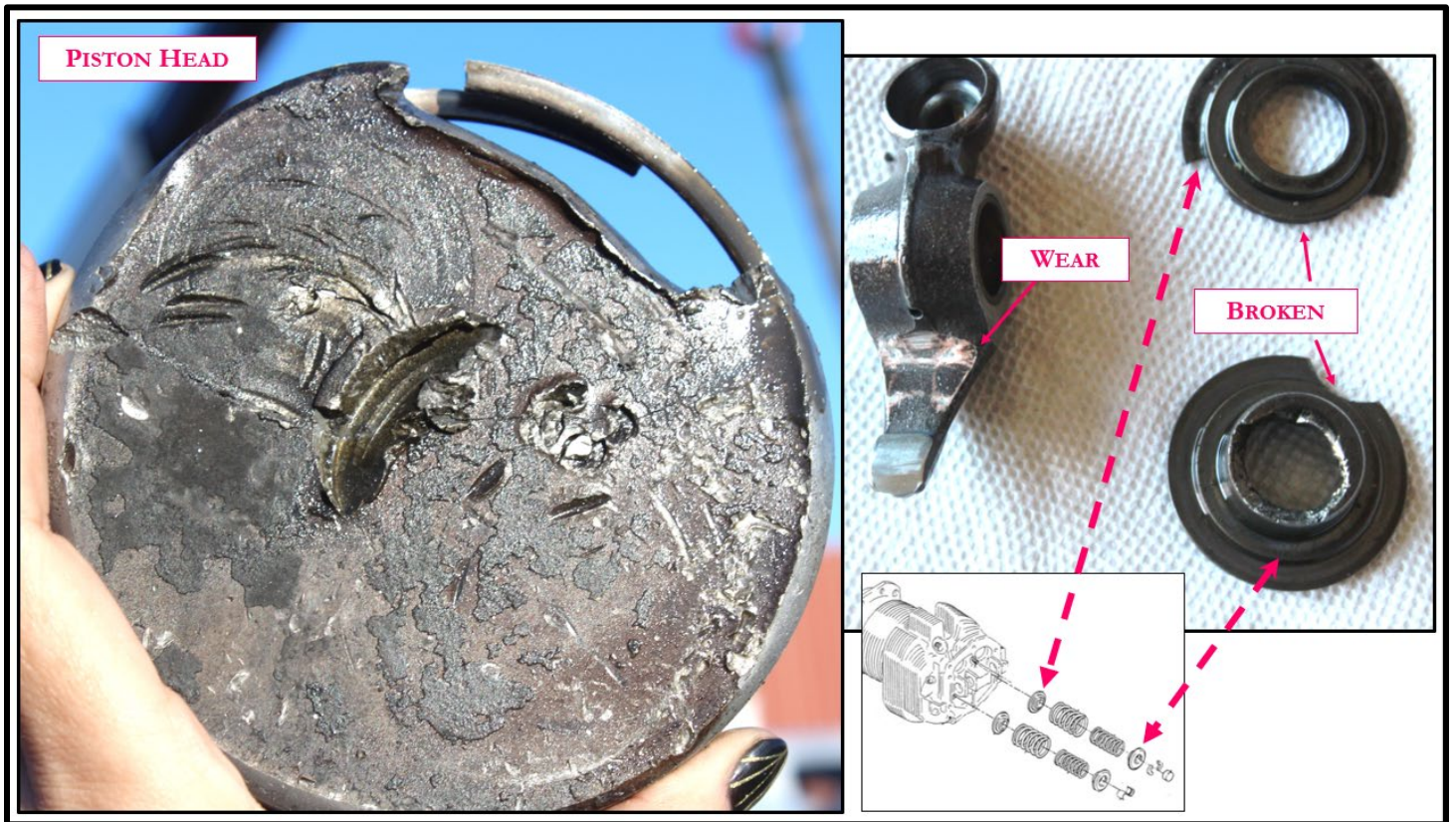


Figure 23: No. 6 Piston Head



Figure 24: No. 6 Exhaust Cylinder Components



Figure 25: No. 6 Exhaust Valve Head and Comparison of Keepers and Rotator Caps

Investigators separated the crankcase halves revealing the camshaft and lifter (tappet) heads. Numerous lifter heads were broken and large pieces were found in the crankcase. The camshaft lobes and heels appeared to have normal wear with no spalling noted.

EXHAUST VALVE

6ea. SL13790 Rocker Shaft

6ea. SL19001A Exhaust Valve

6ea. SL75089 STD Piston

12ea. 17C21191 Keeper

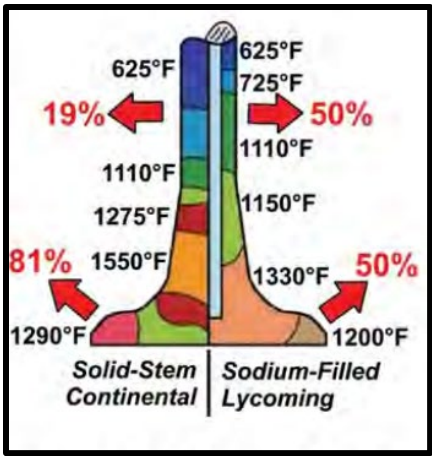
12ea. SL11795 Valve Spring

12ea. SL11800 Valve Spring

17A23938

73938

17B23936 (LW-19001)



PROPELLER

The three propeller blades remained in the hub mounted to the engine. Two of the tree propeller blades were straight with the exception of the blade tips, which displayed aft bending and curling deformation. The third propeller blade was bent aft with a 360° curl at the tip.

RECORDS

The pilot and one owner purchased the airplane in April 2010.

The invoice from the maintenance performed as part of the rebuild in 2018 revealed that purchases were made for new parts. In pertinent part, the mechanic purchases 4 (2 sets) exhaust valve keepers (p/n MS13997-3); the part’s catalogue 17C21191. There were 12 thrust buttons purchased that are fitted at the ends of the rocker shaft and a seal and gasket overhaul set.

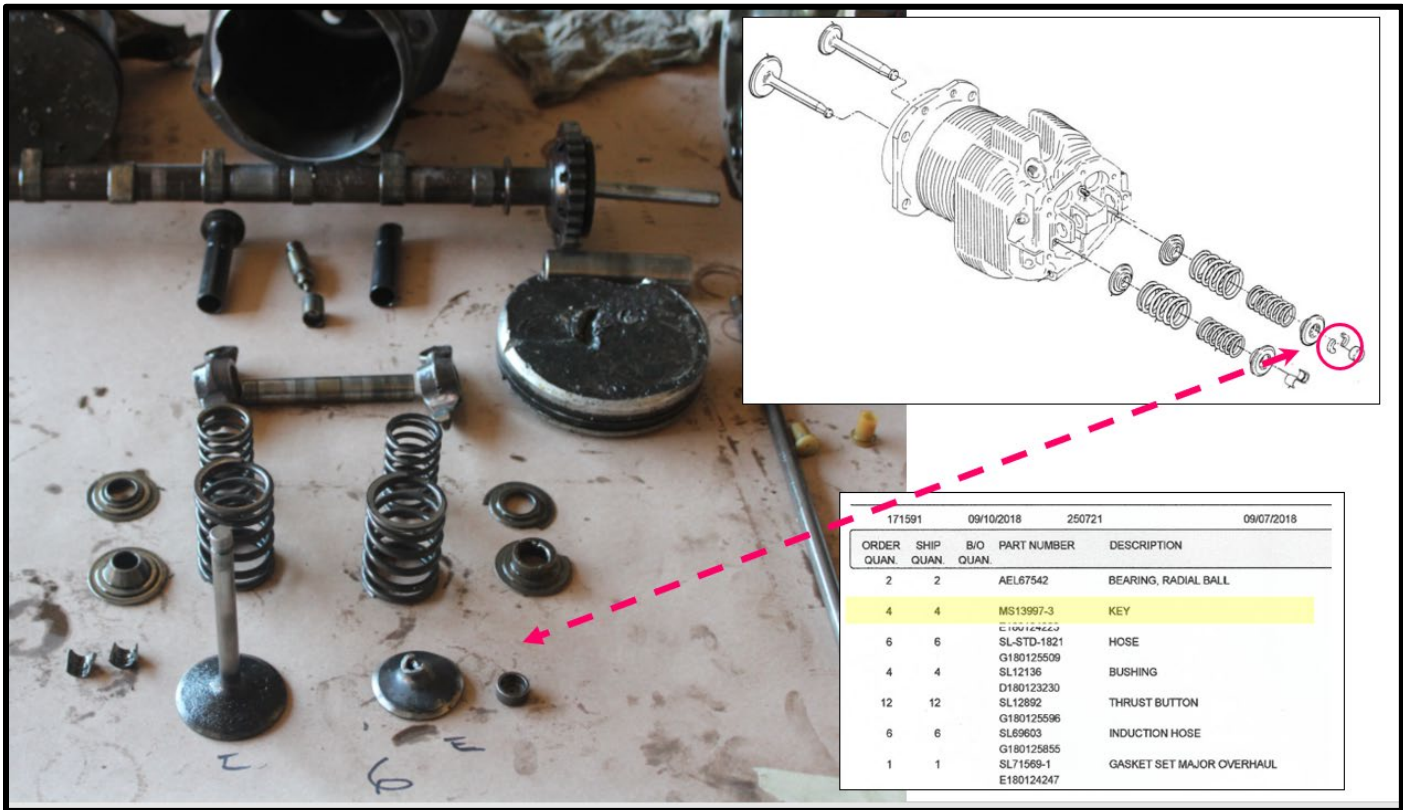


Figure 26: Invoice

The last annual, recorded as being completed in August 2020, show that the a “kinked brass manifold pressure line” was replaced. One of the owner’s stated that he took the removed line and fabricated his own from stainless steel.

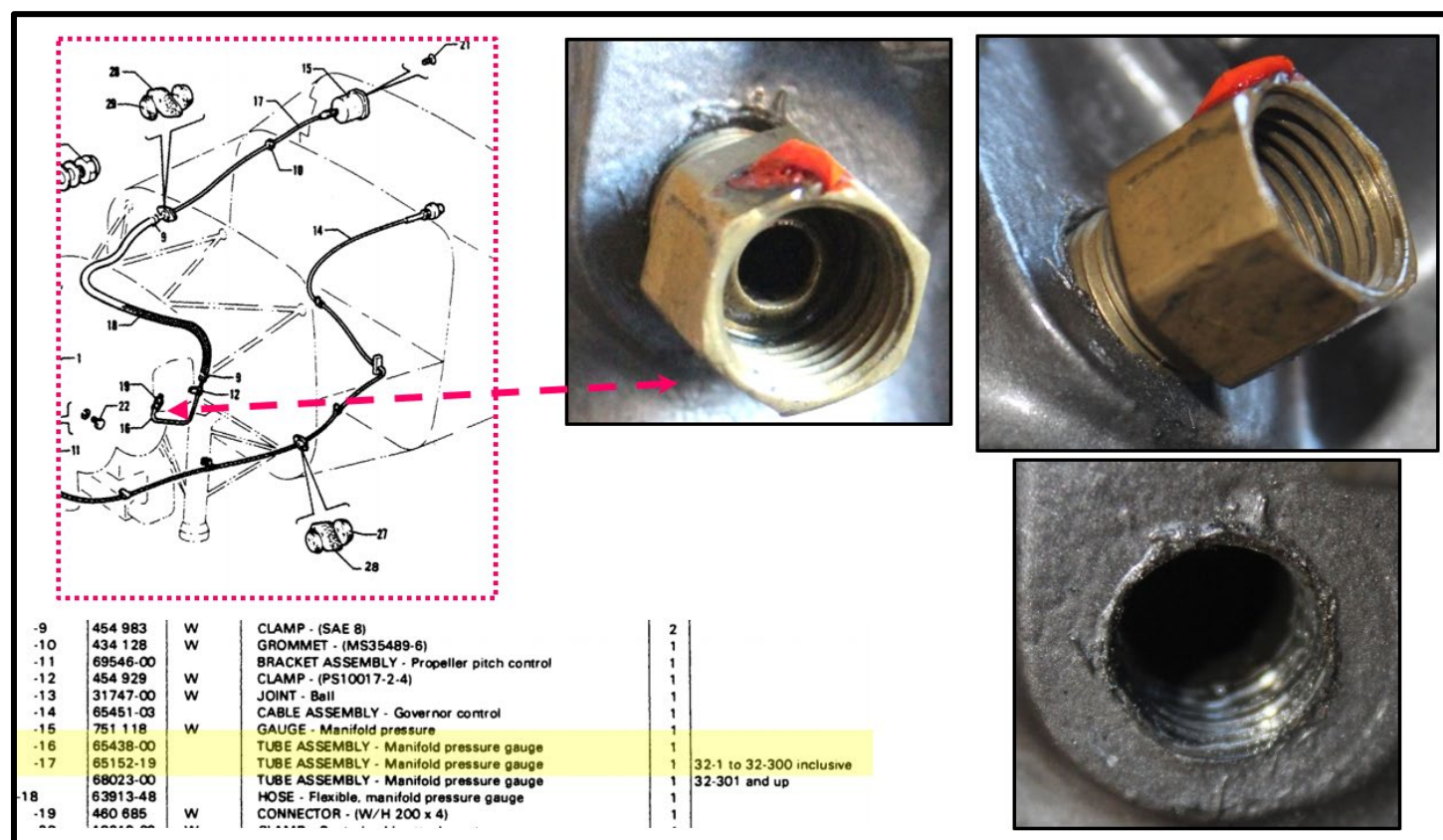


Figure 27: Brass Manifold Pressure Fitting

PERSONNEL INFORMATION

PILOT

LARRY VOIT

Pilot Certificate (PRIVATE PILOT ASEL), was a 53-year-old male. This pilot reported civil flight experience that included 336 total and 4 hours in last six months as of exam dated 9/13/2019. This pilot was 74 inches tall and weighed 175 lbs. at the time of the last exam. This pilot was issued a Third Class Medical Certificate without limitation.

Date	From	To	Time	Landings	Notes	A/C
1983-2019			349.3		Total PA-32 107.6	107.6
2/2/2020	TOA-LGB	TOA	1.6	5	Steep turns, takeoffs, landings	PA-32
2/7/2020	TOA-LGB	TOA	1.8	4	Slow flight, OEI	BE-76
2/14/2020	TOA	TOA	1.5	2	Slow flight, power-off stalls, steep turns	BE-76
2/21/2020	TOA-LGB	TOA	2.1	3	Slow flight, steep turns, stalls, VMC demo	BE-76
2/5/2021	TOA-LGB	TOA	1.6	6	Steep turns	PA-32
		Totals	357.9			110.8

Figure 28: Excerpts from Logbooks

Postmortem

Head: No obvious signs of blunt force trauma, just one minor abrasion to the crown area, laceration under chin (less than inch)

Eyes: No contact lenses, no glasses found at location, No foreign objects within the eye area

Torso/ Lower Extremities: Sternum/ Rib Fracture, Abrasions to the neck and torso, fractured lower back vertebrae, No impalements

Hands/ Wrist: No deformation to hands, no fractures, no clinching, No watch.

Feet/ Ankle: Left Foot separation, fracture to shin area below, prior scar from knee surgery. Nothing on Right Leg.

WEATHER INFORMATION

33.81 °N, 118.15 °W

Long Beach, CA Weather History

Time	Temperature	Dew Point	Humidity	Wind	Wind Speed	Wind Gust	Pressure	Precip.	Condition
12:53 AM	51 °F	42 °F	71 %	CALM	0 mph	0 mph	30.24 in	0.0 in	Fair
1:53 AM	50 °F	38 °F	63 %	CALM	0 mph	0 mph	30.22 in	0.0 in	Fair
2:53 AM	50 °F	36 °F	59 %	CALM	0 mph	0 mph	30.20 in	0.0 in	Fair
3:53 AM	46 °F	35 °F	66 %	NNW	5 mph	0 mph	30.19 in	0.0 in	Fair
4:53 AM	45 °F	35 °F	68 %	CALM	0 mph	0 mph	30.19 in	0.0 in	Fair
5:53 AM	45 °F	35 °F	68 %	CALM	0 mph	0 mph	30.19 in	0.0 in	Fair
6:53 AM	45 °F	34 °F	65 %	NW	3 mph	0 mph	30.21 in	0.0 in	Fair
7:53 AM	50 °F	35 °F	57 %	CALM	0 mph	0 mph	30.21 in	0.0 in	Fair
8:53 AM	56 °F	29 °F	36 %	CALM	0 mph	0 mph	30.22 in	0.0 in	Fair
9:53 AM	60 °F	27 °F	28 %	CALM	0 mph	0 mph	30.20 in	0.0 in	Fair
10:53 AM	65 °F	24 °F	21 %	N	3 mph	0 mph	30.19 in	0.0 in	Fair
11:53 AM	69 °F	22 °F	17 %	VAR	3 mph	0 mph	30.16 in	0.0 in	Fair

Figure 29: Weather Information from Closest Weather Station

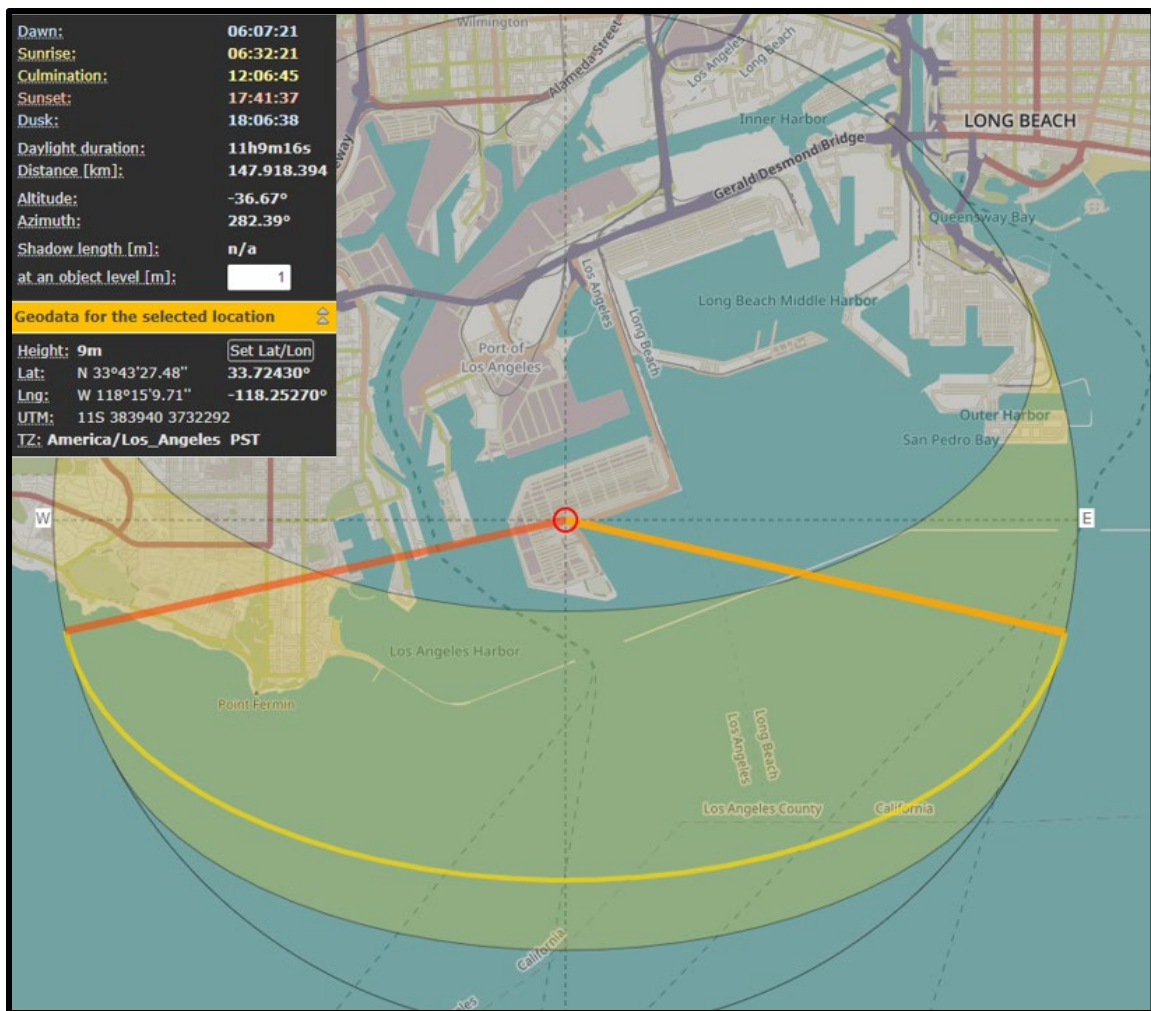


Figure 30: Sun Information at the Time of the Accident