NATIONAL TRANSPORTATION SAFETY BOARD

Office of Research and Engineering
Materials Laboratory Division
Washington, D.C. 20594

November 9, 2017

MATERIALS LABORATORY FIRE FACTUAL REPORT Report No. 17-066

A. ACCIDENT INFORMATION

Place	:	McKinleyville, California
Date	:	July 29, 2016
Vehicle	:	Piper PA-31T
NTSB No.	:	WPR16FA153
Investigator	:	Brice Banning IIC/AS-ANC
		Nancy McAtee Fire Group Chairman RE-30

B. DETAILS OF THE EXAMINATION

The accident aircraft was found in several large sections over a ¼ of a mile area. There was no evidence of significant postcrash/ground fire except for the root-to-nacelle section of both wings which sustain severe postcrash fire damage. The cockpit was separated from the passenger compartment by investigators to ease in wreckage retrieval. The wreckage was collected and moved to a storage facility.

Cockpit section

The cockpit section consisted of the entire fuselage from the nosecone to the forward edge of the wing spar (which was located just aft of the cockpit seats). There was an even, lightly adhered coating of light soot over the entire fuselage exterior skin with several small areas (below the right wing root and along the lower right belly area) with heavier soot deposit. There was no sign of thermal damage to the exterior paint in this area. These fire signatures are shown in Figures 1-7.

There was some localized damage to the outboard side of the fuselage skin at the right wing root. There is a small area of clean burn as well as some thermal related tearing as shown in Figure 8. The inboard side exhibited no thermal damage.

The thermal damage to this area was limited to the floor area between the two forward seats near the main bus tie circuit breaker panel and extended to the forward edge of the wing spar. All exposed surfaces were heavily sooted. There was some localized melting and thermal related tearing of aluminum structure as shown in Figure 9. The primer paint on the floor panels under the right aft corner of the pilot (left) seat and left aft corner of the co-pilot

(right) seat was discolored dark brown as shown in Figure 10. A stringer in this location exhibited broomstrawing as shown in Figure 11[1].

There was a single wire located near the stringer that was shiny in appearance and appeared to have damage to the conductor surfaces as shown in Figure 12. All other wire bundles located in this area were intact and sustained minimal thermal damage. There was evidence of mechanical damage to the conductor ends. Another localized area of thermal damage to a section of wiring was in a large wire bundle that ran through the center tunnel in the floor of the cockpit. All the insulation was either melted, thermally discolored or missing. One large gauge wire end was found to have beading, welding and melting on one end.

The main bus tie circuit breaker panel (located in the floor in this location) was partially missing as shown in Figure 13. The remaining breakers were heavily sooted on the aft end. One breaker was thermally discolored. There were areas of charring on the backside of the panel. The low voltage circuit breaker panel (located forward of this location in the instrument panel) was present but exhibited no thermal damage.

The hydraulic lines servicing the landing gear system were also located in this area. There were no intact lines found. The lines all exhibited signs of thermal exposure (melting and sections of missing material in the lines).

The main bus tie circuit breaker panel, landing gear hydraulic lines, fuel cross-feed lines and the main bus tie wiring that connected to the circuit breaker panel were removed from the aircraft and sent to the Materials Laboratory for further examination[2].

The left and right forward seats exhibited light thermal discoloration and some thermal related shrinking on the inboard edges as shown in Figure 14. The seat frames had some thermal discoloration on the rear inboard legs.

The carpet around the rudder pedal was charred as shown in Figure 15. Personal items and notebooks located in the center area of the floor also were thermally discolored and charred.

Passenger/EMS section

The passenger/EMS section of the cabin exhibited little fire/thermal related damage. There was a light coating of soot on the exterior of the fuselage skin as shown in Figure 16. The cabin interior was undamaged. The wiring bundles located in the floor of this section were intact and most did not exhibit thermal damage. One bundle was damaged by fire. All the insulation was missing from all the wire conductors and the bare wire conductors were discolored and oxidized. The fuel cross-tie lines were located midline under the floor of this

[1] A fire signature where a near-molten aluminum component subjected to a shock loading (e.g., impact) can take on the physical appearance of broomstraw or feather-like appearance.
[2] For further information on the examination of the submitted components, see Materials Laboratory report No. 17-067.

section as shown in Figure 17. As stated above, this fitting was removed from the aircraft for further examination.

Fuel powered cabin heater

The cabin heater was removed from the nosecone for examination. The heater exhibited no thermal damage and appeared intact as shown in Figure 18. All the ducting for the heater was examined and no sooting was present.

The fuel line for the heater was examined. The line was intact to the forward edge of the wing spar. There was a hole in the line in this location but no visible sign of thermal related damage as shown in Figure 19. The line had a full diameter fracture several inches aft from the hole in the line. Fuel was still present in the line.

LifePort System

The LifePort system's electrical service wiring located in the passenger section was examined[3]. Apart from two small, isolated thermal discoloration patterns on the surface of the insulation, shown in Figure 20, there was no thermal related damage to any of the wiring for the system in this area. The system panel, as shown in Figure 21, was also undamaged by fire.

Empennage

The pieces of recovered empennage including the vertical stabilizer were covered with a light coating of soot but were otherwise undamaged by fire as shown in Figure 22.

Right Wing

As shown in Figure 23, the section of wing that runs from the wing root to the engine nacelle was heavily damaged in a postcrash fire. The wing tip section including the tip tank was sooted but undamaged by fire as shown in Figure 24.

Left Wing

The section of wing that runs from the wing root to the engine nacelle was heavily damaged in a postcrash fire as shown in Figure 25. The wing tip section had two oval-shaped burn patterns on the upper and lower wing skin. The interior compartment exhibited melting at several lightening holes and discolored primer paint as shown in Figure 26. The internal fuel lines and the tip tank were missing.

[3] For information on sections of the LifePort system wiring that remained with the cockpit and main bus tie circuit breaker panel, see Systems Group Chairman Factual report and Materials Laboratory Factual Report 17-067.

Wreckage found after initial examination

A small section of the left side of the vertical stabilizer was found several months after the original wreckage was recovered, shown in Figures 27 and 28. The section had some localized thermal damage and sooting on the lower edge. Some blistering of the exterior paint was present in the damaged area and along the right edge of the piece directly above the damaged area.

Nancy B. McAtee
Fire and Explosion Specialist

Figure 1. Overall photograph of front of aircraft

Figure 2. Photograph of right nosecone area of aircraft.

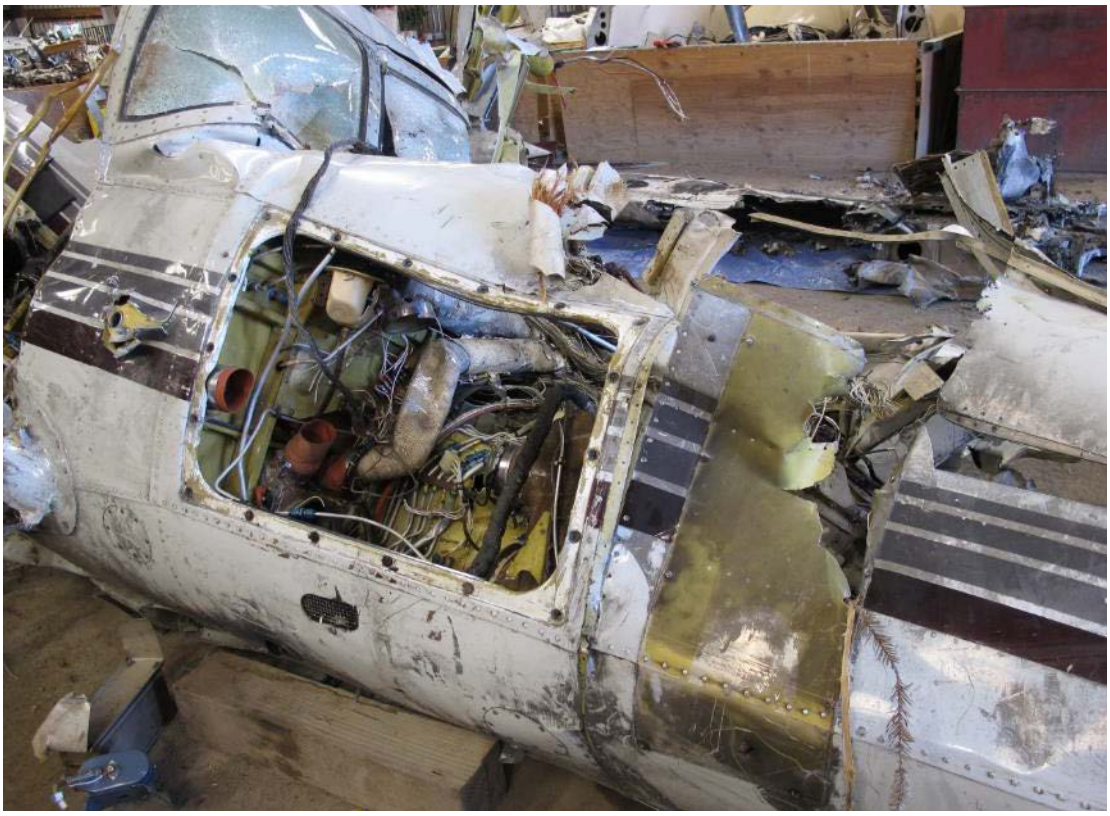

Figure 3. Photograph of right side forward of the cockpit.

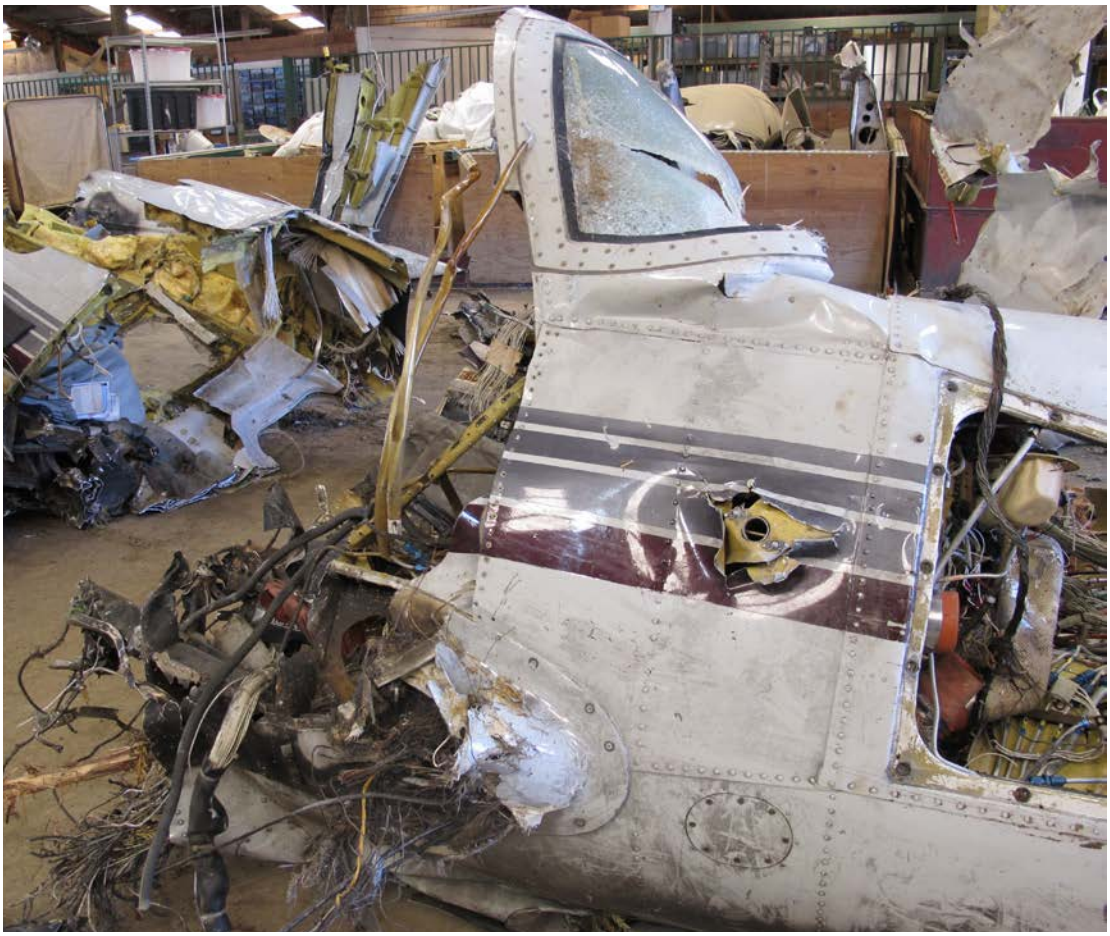

Figure 4. Right side of cockpit exterior.

Figure 5. Photograph of right side under cockpit.

Figure 6. Photograph of left nosecone area of aircraft.

Figure 7. Photograph of left exterior side of cockpit.

Figure 8. Closeup photograph of thermal tearing on right wing root.

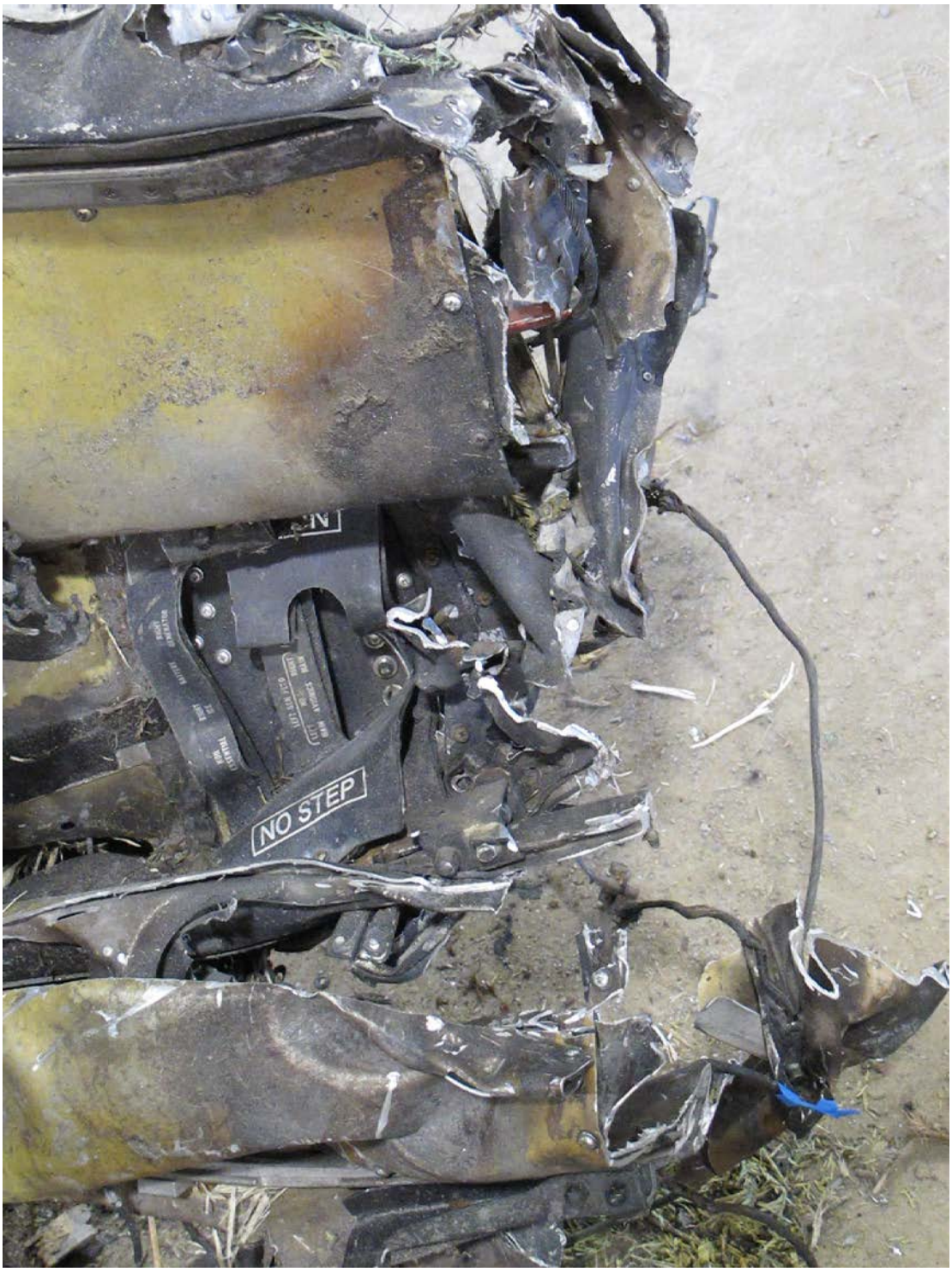

Figure 9. Overall photograph of main bus tie circuit breaker panel and surrounding structure.

Figure 10. Photograph of thermal damage to aircraft structure near main bus tie circuit breaker panel.

Figure 11. Closeup of broomstrawing on structure near main bus tie circuit breaker panel.

Figure 12. Closeup photograph of damaged wire (L Main 2) located near main bus tie circuit breaker panel.

Figure 13. Photograph of underside of main bus tie circuit breaker panel.

Figure 14. Photograph of cockpit seats.

Figure 15. Photograph of damaged cockpit carpet and floor mats.

Figure 16. Photograph of right side of passenger/EMS section of aircraft.

Figure 17. Closeup photograph of fuel crosstie lines at wing spar.

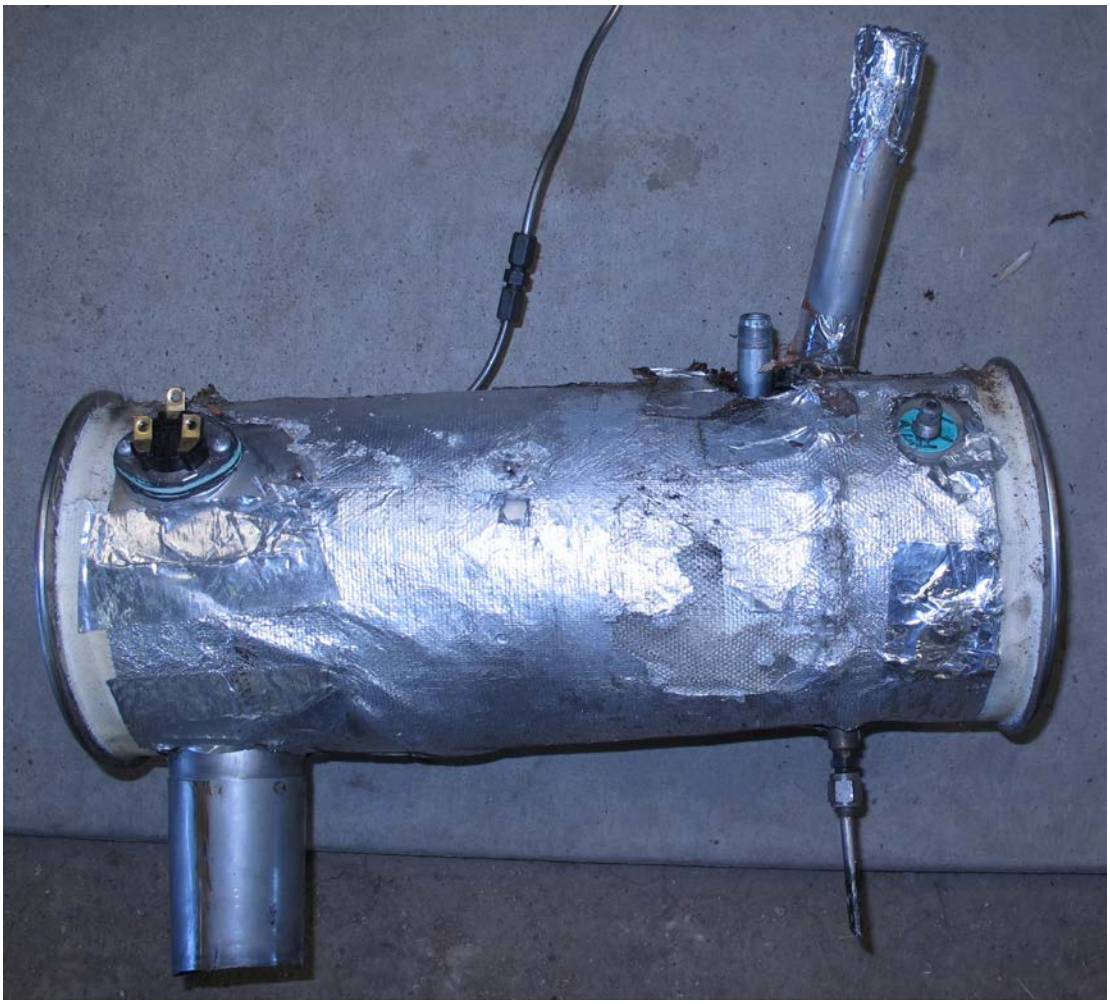

Figure 18. Photograph of cabin heater.

Figure 19. Closeup photograph of hole in cabin heater fuel supply line.

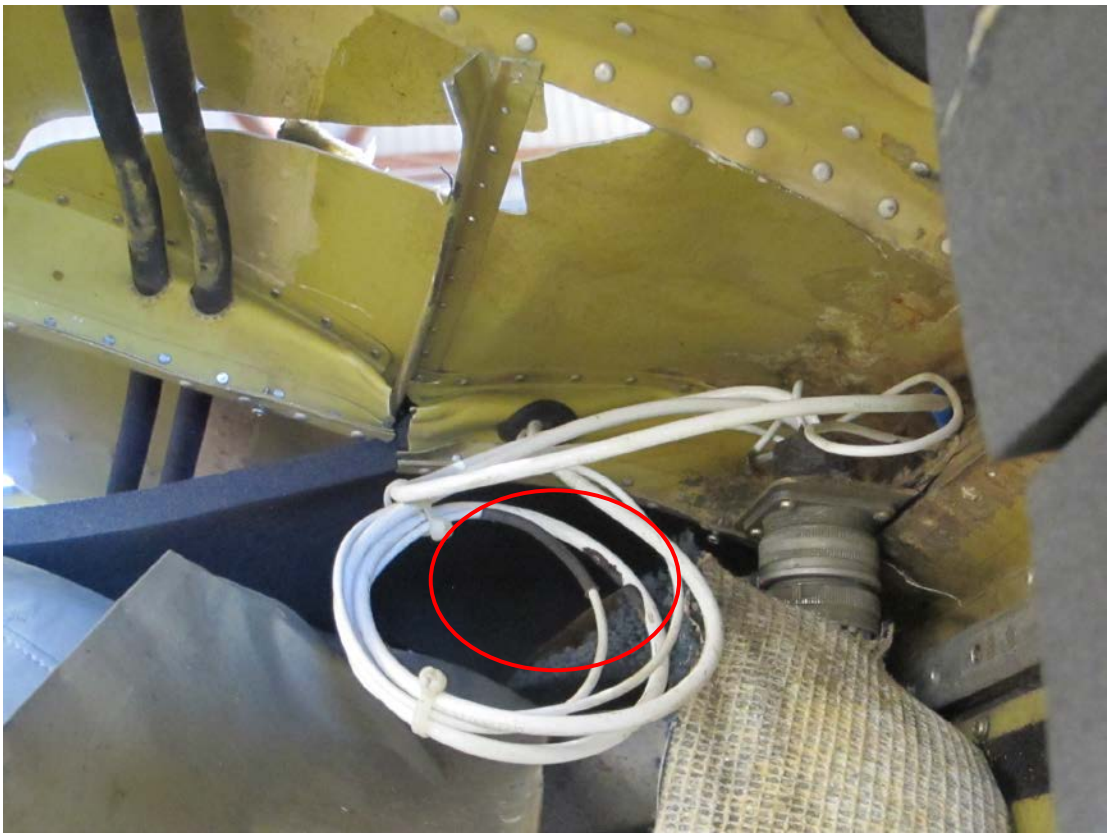

Figure 20. Photograph of thermal damage (circled in red) to LifePort wiring.

Figure 21. Photograph of LifePort panel (interior on left, exterior on right).

Figure 22. On scene photograph of section of vertical stabilizer.

Figure 23. Photograph of remaining right wing structure.

Figure 24. Photograph of right wing tip tank.

Figure 25. Photograph of thermal damage to left wing.

Figure 26. Photograph of thermal damage to interior of left wing fuel bay.

Figure 27. Overall photograph of recovered portion of the vertical stabilizer-left side.

Figure 28. Closeup of thermal damage of left side section of vertical stabilizer.