

NATIONAL TRANSPORTATION SAFETY BOARD

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



November 15, 2007

MATERIALS LABORATORY FACTUAL REPORT

Report No. 07-116

A. ACCIDENT

Place : Sanford, Florida
Date : July 10, 2007
Vehicle : Cessna 310R, N501N
NTSB No. : NYC07MA162
Investigator : Joseph Panagiotou

B. COMPONENTS EXAMINED

Wire bundle with female plug connector
Single Strands of wire
ID Tag from combustion heater
Portion of Circuit Breaker Panel
Portion of instrument panel
Part from DE-ICE system from RH engine nacelle
GPS antenna and mounting bracket
Terminal Block
Portion of Radar system

C. DETAILS OF THE EXAMINATION

Wire bundle with female plug connector

The wire bundle consisted of approximately 12 inches of wire terminating at a female plug connector (Figure 1). Based on the type of the connector on the end of the wire bundle, Cessna representatives indicated that it is most likely from the Navigation/Communication radios and would go into the back of the Nav/Com radio rack. The wire bundle had been exposed to a post crash fire. The wires and connector plug were heavily damaged by fire. The connector had become friable but was still mostly intact. The wires had become brittle. The connector had positions available for 26 conductors, although 23 were in use. The insulation was missing from the wires with the exception of small flecks of charred insulation remaining in an area approximately 2 inches from the end with the female plug connector. All the wires in this bundle appeared to be the same size, 0.046 inch in diameter. The end of the wire bundle opposite the connector exhibited beading and other resolidification after melting. Globules of re-solidified copper were found to have fused multiple

wires together as well as having formed single beads on the ends of some wires (Figure 2). Large portions of these wires also exhibited strand fusing¹.



Figure 1. Wire bundle with female plug connector.



Figure 2. Beading on end of wire bundle.

¹ Strand fusing is when the strands that make up a stranded wire fuse together rendering the wire rigid and usually brittle.

Single Strands of Wire

The strands of wire consisted of 3 separate small sections of wire, each approximately 3 to 4 inches long, with no end termination. Two pieces were 0.041 inch in diameter, and the third was 0.090 inch in diameter. The two smaller gauge pieces of wire had small globules of melted metal stuck to them and exhibited strand fusing. The larger gauge piece of wire had a large bead at one of the ends (Figure 3) consistent with arcing and did not exhibit strand fusing. It is not known what components or systems in which these wires were originally installed.

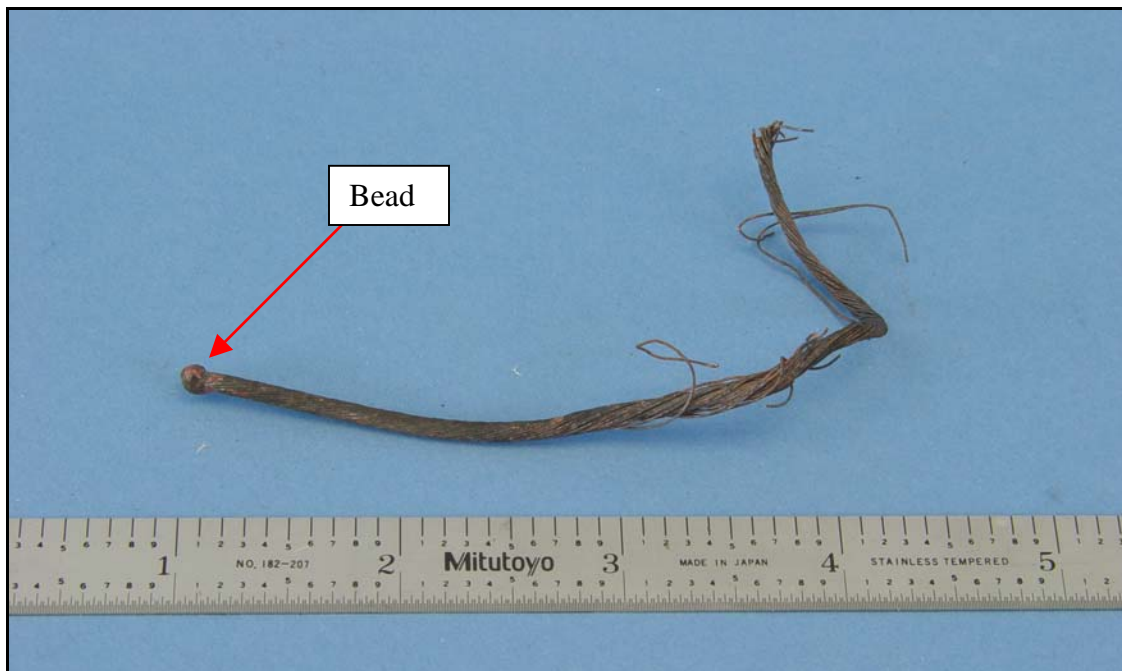


Figure 3. Wire with bead from arcing.

ID Tag from combustion heater

The ID tag from the aircraft's combustion heater was made from a thin foil material, which was originally attached to the combustion heater's body with an adhesive. The ID tag was heavily fire damaged and covered with soot. The Tag was examined to see if there was any legible model number present. Cleaning with a solvent and inspection with a microscope revealed the serial number and model number of the combustion heater.

Serial: 148

Model: 8259JR-2

Portion of Circuit Breaker Panel

A section of the circuit breaker panel was recovered on scene (Figure 4). The fire and impact forces heavily damaged the circuit breakers present on this section of the panel. The mechanical latches

for the circuit breakers were damaged to the point where it was not possible to make a determination of whether or not they were open or closed at the time of the accident. All the wiring behind this portion of the circuit breaker panel was examined for evidence of electrical damage. No beading, pitting, or other signs of electrical faults were observed.

Portion of instrument panel

The portion of the instrument panel that was recovered was from the bottom left hand side of the instrument panel (Figure 5). This portion included the ventilation nozzle and the starter and generator switches as well as the main power switches. Due to the impact forces and subsequent fire damage the condition of the switches was such that a reliable determination of their position prior to impact was not possible. The aluminum structure of the switch panel was heavily fire damaged and was missing its painted finish. The wiring that remained connected to the switch panel had lost all of its insulation leaving the wires bare. Plastic that had melted and re solidified was found adhering to the wires in some locations. No beading, pitting, or other sign of electrical failures was observed among these wires.

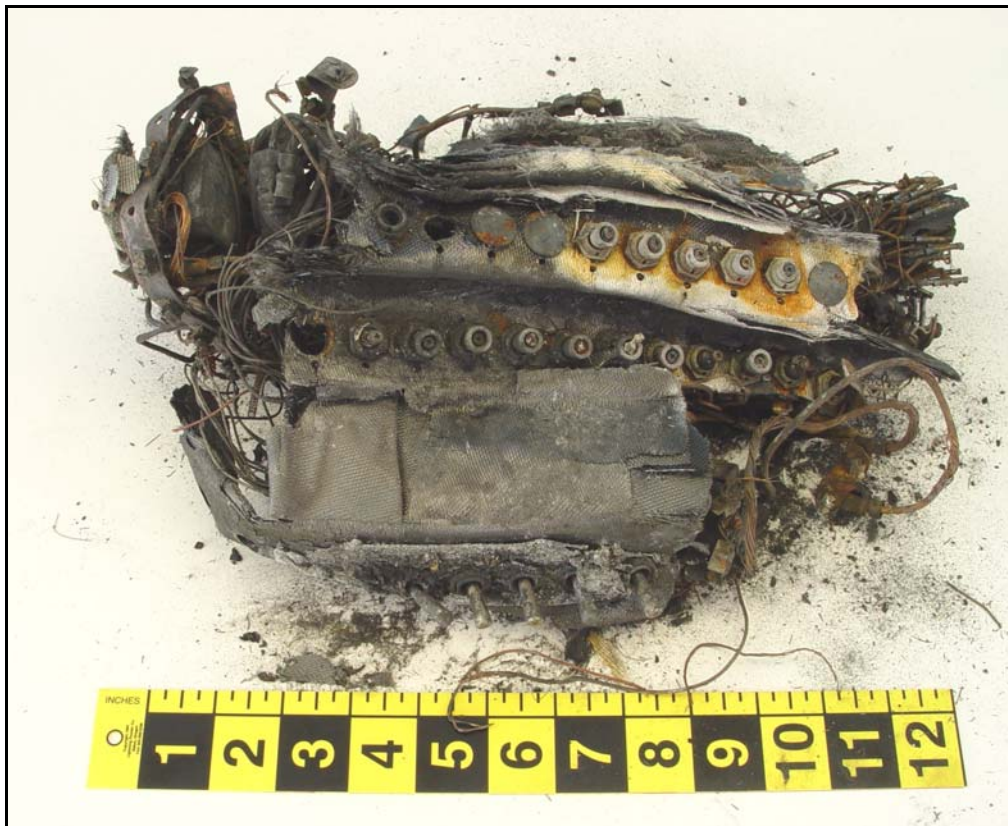


Figure 4. Portion of circuit breaker panel.



Figure 5. Lower Left portion of instrument panel.

Portion of DE-ICE system from right engine nacelle

The component shown in Figure 6, identified as part of the DE-ICE system from the right engine nacelle, was found away from the main impact and post crash fire zone. A soot deposit was found on this part surrounding a clean, non-sooted area that was protected prior to fracture and deformation of the part (Figure 6). The soot deposit was heavy, but was limited to a specific area and did not extend over the entire part. Some insulated electrical wires and a rubber hose fitting were located in the vicinity of this soot deposit, but none of these parts showed any signs of thermal degradation or any other effects of exposure to fire. According to Cessna representatives, this soot deposit is consistent with a minor exhaust leak.

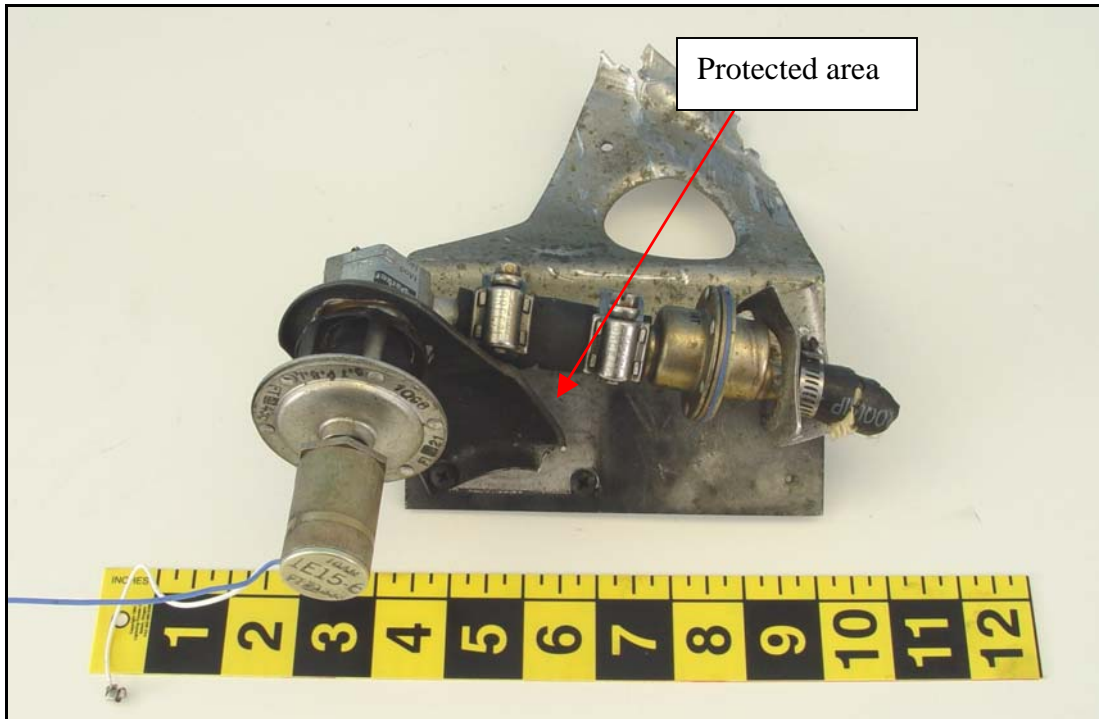


Figure 6. Portion of the DE-ICE system.

GPS antenna and mounting bracket

The GPS antenna and mounting bracket were of the type used as an external antenna and mounting system for hand held Garmin® GPS devices. The mounting bracket was metal with a painted black finish and small suction cups for attaching onto a smooth surface. This mounting bracket was bent but had no sign of thermal damage. The GPS antenna was screwed onto the mounting bracket. The antenna was encased in a plastic housing with one wire exiting the housing. This wire was severed a few inches away from the antenna. The antenna had no signs of thermal damage or soot deposition.

Terminal Block

The terminal block was heavily damaged by fire and impact forces (Figure 7). The frame of the terminal block was twisted and bent out of shape. The terminal blocks had become friable from exposure to the fire. The few wires and connector pins remaining attached to the terminal block were examined and no signs of electrical faults were identified.



Figure 7. Terminal block.

Radar system component

A component belonging to the weather radar antenna assembly was examined (Figure 8). This component was severely damaged by impact forces. Additionally this component had severe thermal damage. Some electronic circuit boards were attached to this component. These circuit boards had become delaminated due to the exposure to fire. No arcing or other signs of electrical faults were observed on this component or the accompanying circuit boards.



Figure 8. Radar system component.

Joseph Panagiotou
Fire & Explosion Investigator