

NATIONAL TRANSPORTATION SAFETY BOARD

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



August 24, 2022

MATERIALS LABORATORY FACTUAL REPORT

Report No. 22-063

A. ACCIDENT INFORMATION

Place : Danville, VA
Date : 2/1/2022
Vehicle : Cessna 310R, N622QT
NTSB No. : ERA22FA114
Investigator : Lynn Spencer

B. COMPONENTS EXAMINED

Hartzell combustion heater assembly (Figure 1).

C. DETAILS OF THE EXAMINATION

The aircraft heater assembly was a Hartzell model CD45K (P/N:CD14073-1). The heater assembly had sustained impact damage from the crash and exhibited deformation of the outer casing, heat exchanger and combustor chamber sections as well as separation of some of the external accessories. The combustion air blower and fuel pump accessories had separated from the heater assembly. The ignition coil had separated from the heater assembly and was only attached by the ignition cable. The heater assembly did not exhibit any external fire or thermal damage. The remaining external accessories, hoses and wires were removed for the disassembly process.

The outer casing of the heater was unfastened and pried apart to remove the heat exchanger and combustor assembly. Ventilation air to the cabin would pass between the outer hot section of the heat exchanger and the interior surface of the outer casing. The interior surface of the outer casing (Figure 2) did not exhibit any signs of soot to indicate a leak of combustion products from the outer hot section of the heat exchanger. The exterior surface of the outer hot section of the heat exchanger (Figures 3, 4) did not exhibit any defects or failure of the materials that would allow combustion products to intermix with the ventilation air. All the weld seams were intact and there were no areas of rusted or eroded material.

This combustion heater had two paths for the ventilation air to pass through and become heated. One path was between the outer hot section of the heat exchanger and the interior of the outer casing as described in the previous paragraph. The other path was through the space between the outer hot section and inner hot sections of the heat exchanger. The inner and outer hot sections of the heat exchanger were concentric and connected by three ports referred to as crossovers. The inner hot section also included

the combustor portion of the heater. The heat exchanger and combustor assembly was sectioned to facilitate examination of the interior surfaces and crossover ports between the interior hot section and the outer hot section. First a longitudinal section was made splitting the heat exchanger and combustor assembly in half (Figure 5). Additional, perpendicular sections were made at the ends of both halves of the heat exchanger and combustor assembly to allow the individual layers of the assembly to be examined (Figures 6, 7). Examination of the layers of the heat exchanger did not reveal any defects or failure of the materials that would allow combustion products to intermix with the ventilation air. The weld seam of the end cap of the interior hot section was intact with no evidence of any cracking (Figure 8). The weld seam of the outer hot section layers was intact with no evidence of any cracking (Figure 9).

The section containing the combustor of the heater was further sectioned to reveal the crossover ports. All three crossover ports were examined, and no cracks or other defects were identified (Figures 10, 11, 12).

Overall, the welds and materials comprising the heater were found to be intact and free of defects that could have allowed the combustion products to intermix with the ventilation air.

Joseph Panagiotou
Fire Protection Engineer



Figure 1: Parts as received.

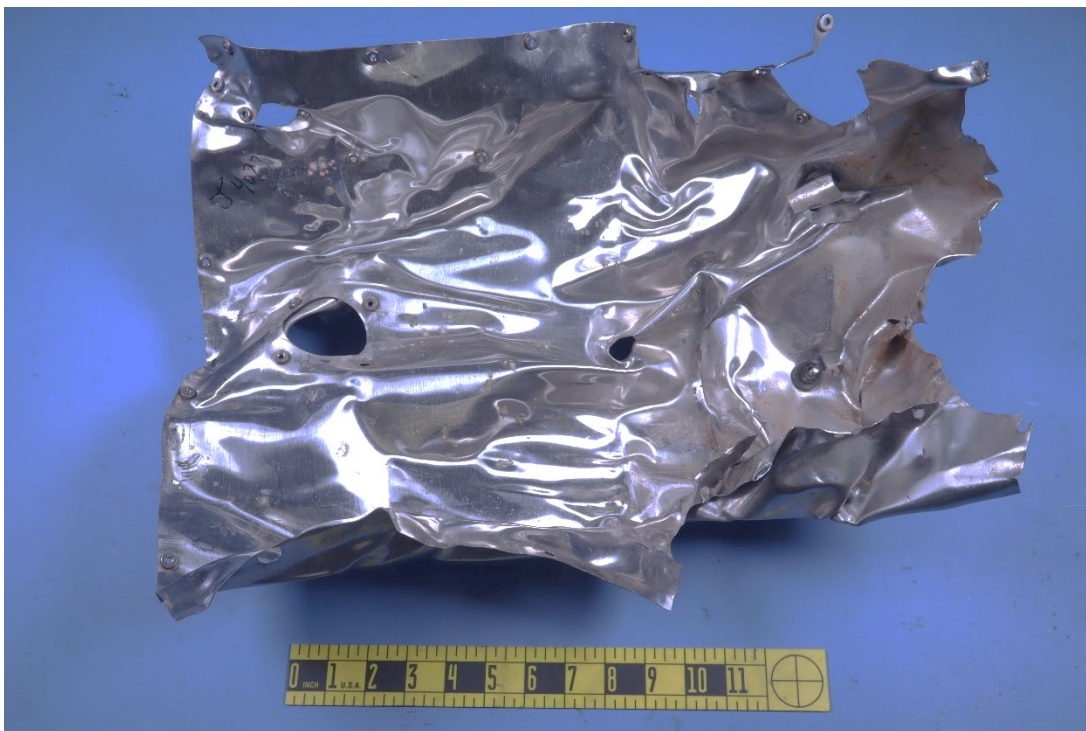


Figure 2: Interior surface of outer casing.



Figure 3: Exterior surface of outer hot section.



Figure 4: Exterior surface of outer hot section.



Figure 5: Heat exchanger and combustor assembly sectioned.

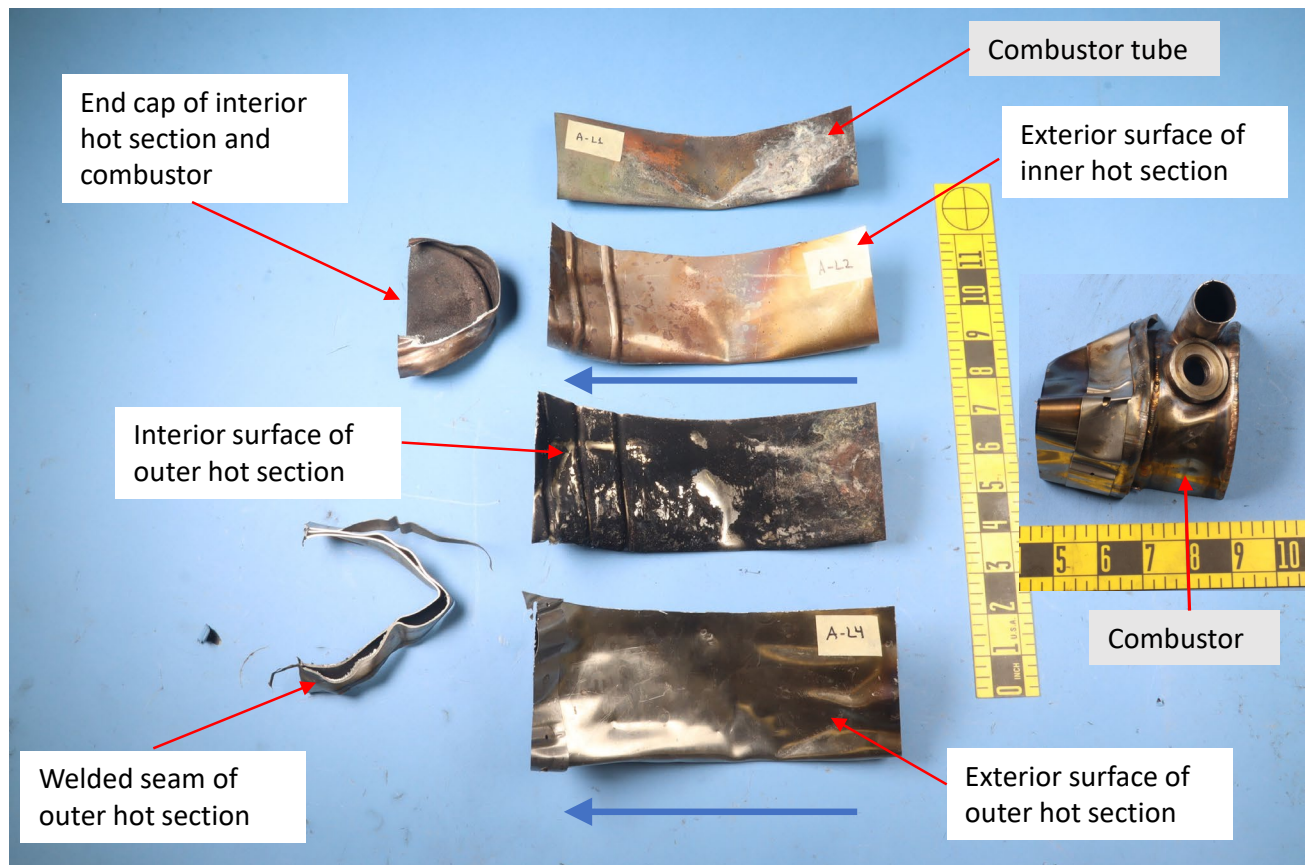


Figure 6: Disassembly of heat exchanger and combustor assembly layers. Blue arrows indicate ventilation air paths.

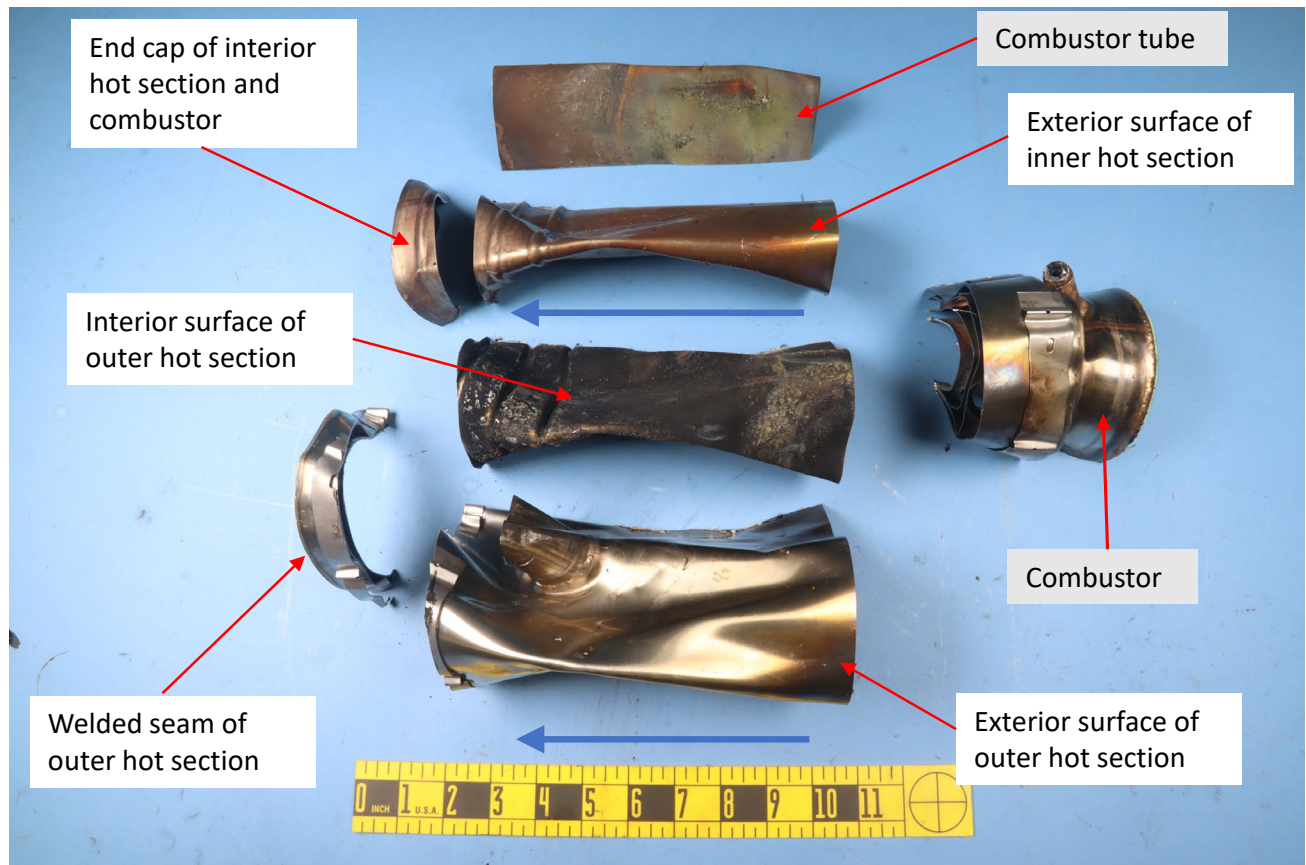


Figure 7: Disassembly of heat exchanger and combustor assembly layers. Blue arrows indicate ventilation air paths.



Figure 8: Weld seam on the end cap of the interior hot section.



Figure 9: Weld seam of the outer hot section layers.



Figure 10: Crossover port #1.



Figure 11: Crossover port #2.



Figure 12: Crossover port #3.