

NATIONAL TRANSPORTATION SAFETY BOARD

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



September 10, 2018

MATERIALS LABORATORY FACTUAL REPORT

Report No. 18-068

1. ACCIDENT INFORMATION

Place : St. Croix, United States Virgin Islands
Date : December 7, 2017
Vehicle : Beech BE-58, N4494A
NTSB No. : ERA18FA046
Investigator : Millicent Hill, AS-ERA

2. COMPONENTS EXAMINED

Fuel manifold

3. DETAILS OF THE EXAMINATION

On December 7, 2017, about 2100 Atlantic standard time, a Beech BE58 was destroyed after it impacted terrain while attempting to return to the Henry E. Rohlsen Airport (TISX), Christiansted, St. Croix, United States Virgin Islands (USVI), shortly after takeoff. The private pilot and four passengers were fatally injured. According to preliminary information, shortly after takeoff the pilot reported engine problems and requested a return to the airport. There were no further communications between ATC and the airplane after this request. The airplane was powered by two Continental IO-520 engines driving Hartzell three-bladed, constant-speed, full feathering propellers.¹ A fuel manifold from the wreckage was sent to the NTSB Materials Laboratory for additional examination.

Figure 1 and Figure 2 show the fuel system manifold from the front (labeled) side and the reverse side, as received. The front sticker stated, "Manifold Valve, Fuel Injection System, P/N 631427-2A12, S/N 1037101." The reverse side exhibited a vibroetched serial number. In addition, the valve fittings were labeled using permanent marker 1 through 6, as shown in Figure 2. These positions were labeled prior to receipt by the NTSB Materials Laboratory.

The backside valve fittings were examined and none contained any evidence of foreign material or contamination. However, the forward valve fittings (labeled positions 1.5 and 5.5 for the purposes of this report) did exhibit material in the internal channels. As

¹ The Continental IO-520 is a six-cylinder, fuel-injected, horizontally opposed aircraft engine produced by Teledyne Continental Motors, headquartered in Mobile, AL.

shown in Figure 3 and Figure 4, this material appeared dull white in color, with a general blocky and jagged morphology.

Some of this material was removed from the 1.5 valve fitting. The material fractured readily, consistent with a brittle material. Figure 5 shows some of this material as viewed using a scanning electron microscope (SEM). The material exhibited electron charging effects, consistent with the behavior of non-conductive materials examined using an electron beam. Figure 6 shows a closer view of a typical surface of this material. The surface (also exhibiting electron charging) exhibited a needle-like texture when viewed at high magnification.

The material chemical composition was examined using energy dispersive x-ray spectroscopy (EDS). A typical spectrum is illustrated in Figure 7. As shown in the spectrum, the material exhibited high amounts of aluminum (Al) and oxygen (O), as well as detectable minor amounts of iron, chlorine, and carbon. The amount and proportion of these elements was consistent with aluminum oxide (Al_2O_3). The other observed properties of the material found manifold valve fittings would be consistent with those of aluminum oxide.

Erik M Mueller
Materials Research Engineer

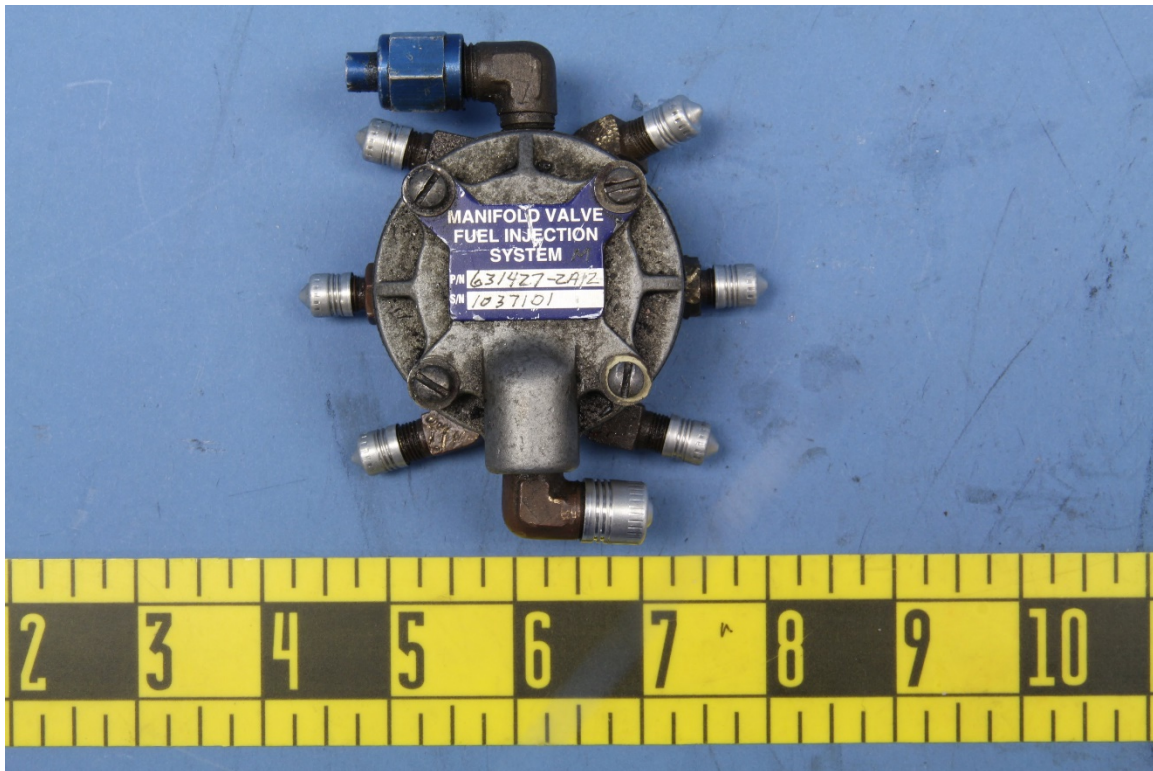


Figure 1 – The fuel manifold assembly, as received, viewed from the front side.

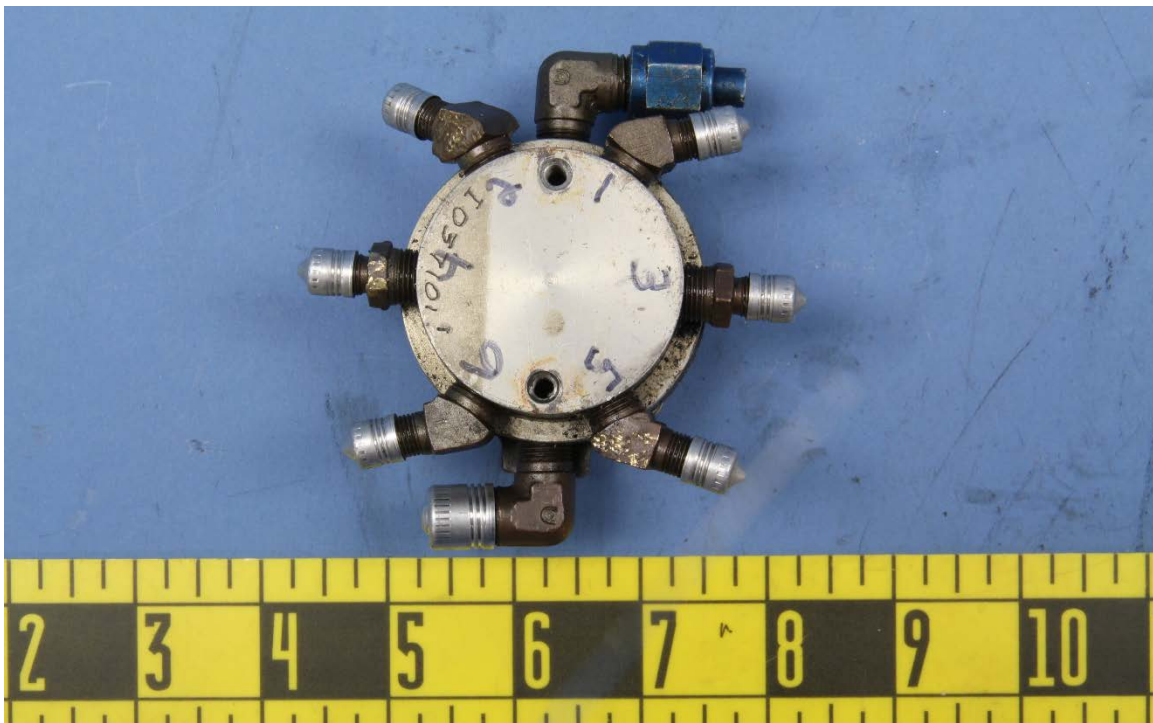


Figure 2 – The fuel manifold assembly, viewed from the reverse side, with labeled fitting locations.



Figure 3 – Closer view of the 1.5 fitting orifice, showing white-colored material inside.

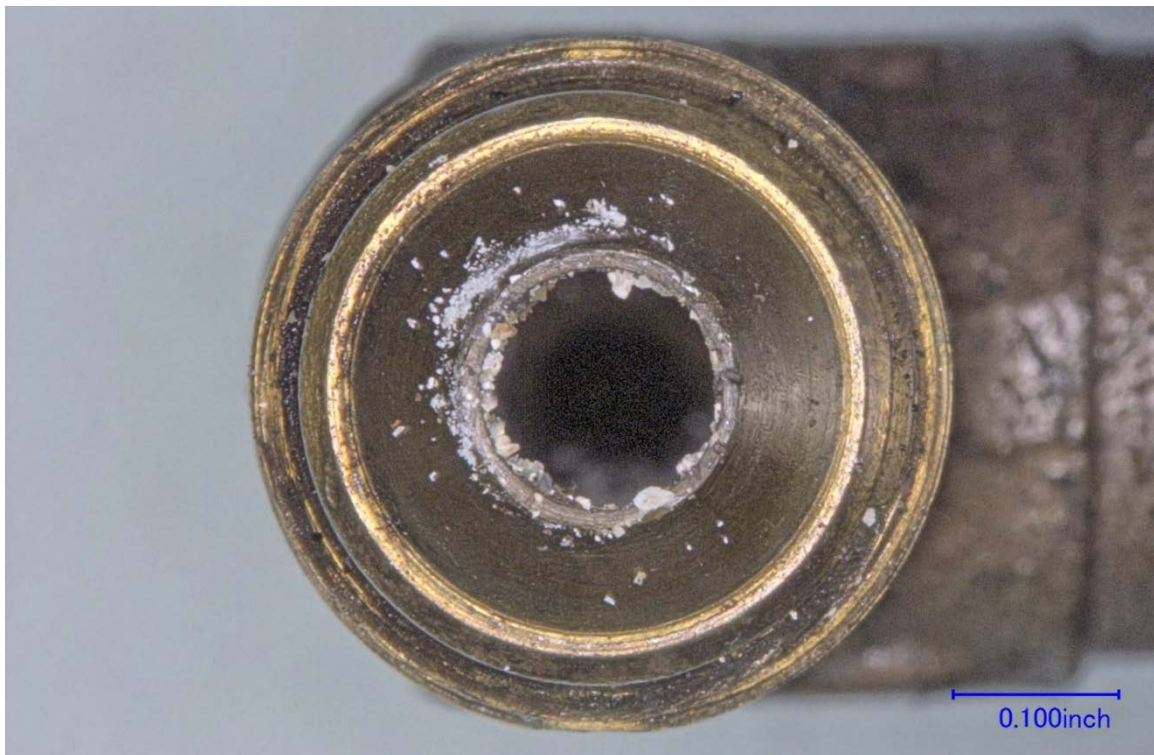


Figure 4 – Closer view of the 5.5 fitting orifice, showing white-colored material inside.

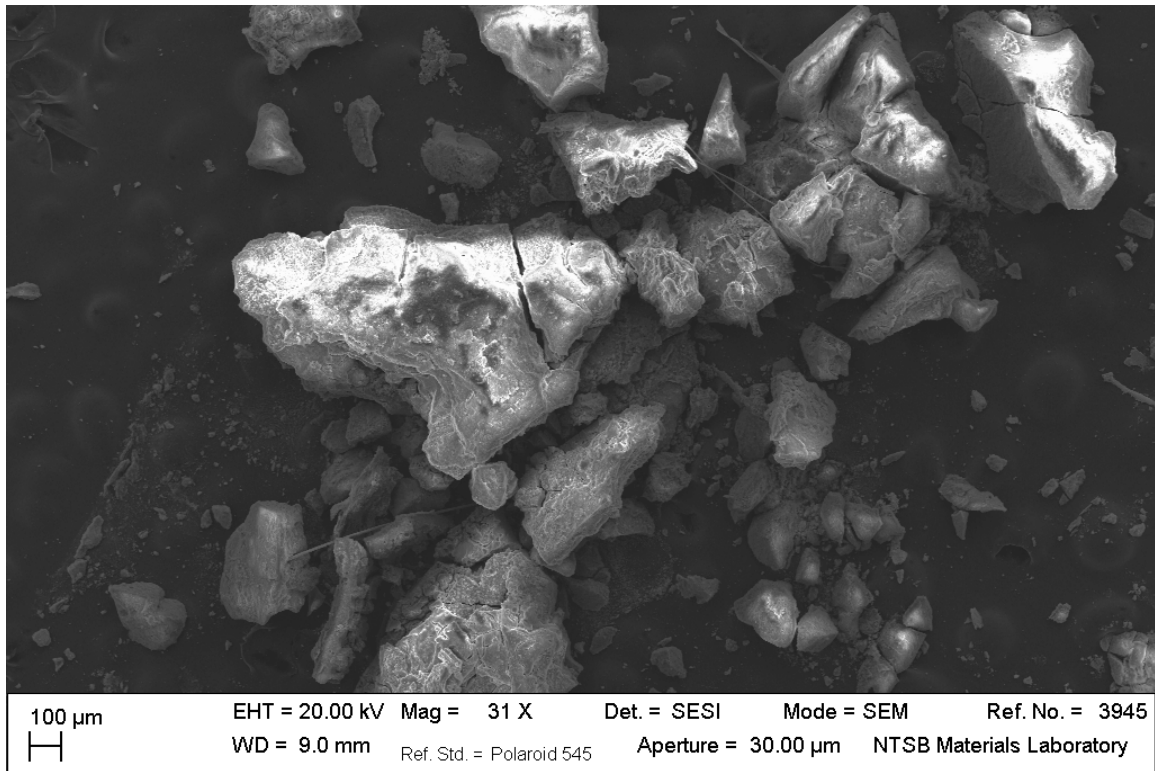


Figure 5 – Secondary electron (SE) micrograph of the material removed from the 1.5 fitting.

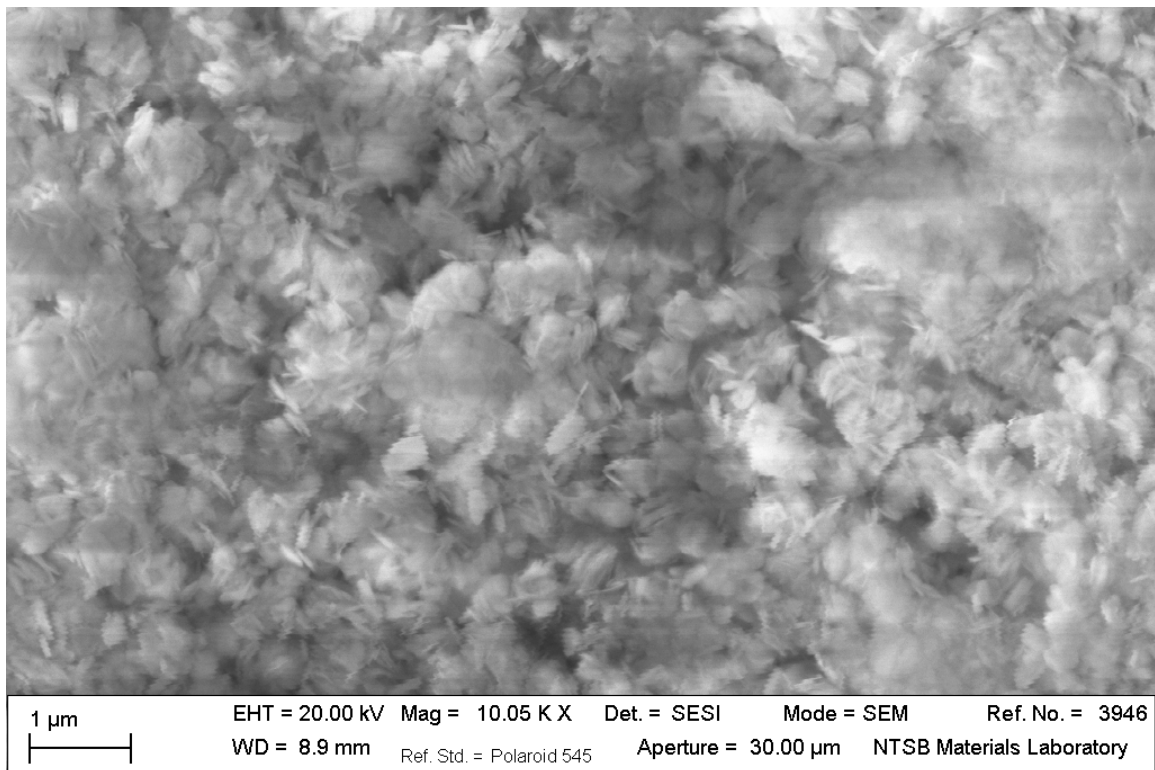


Figure 6 – SE micrograph of a closer view of the surface of the material from Figure 5.

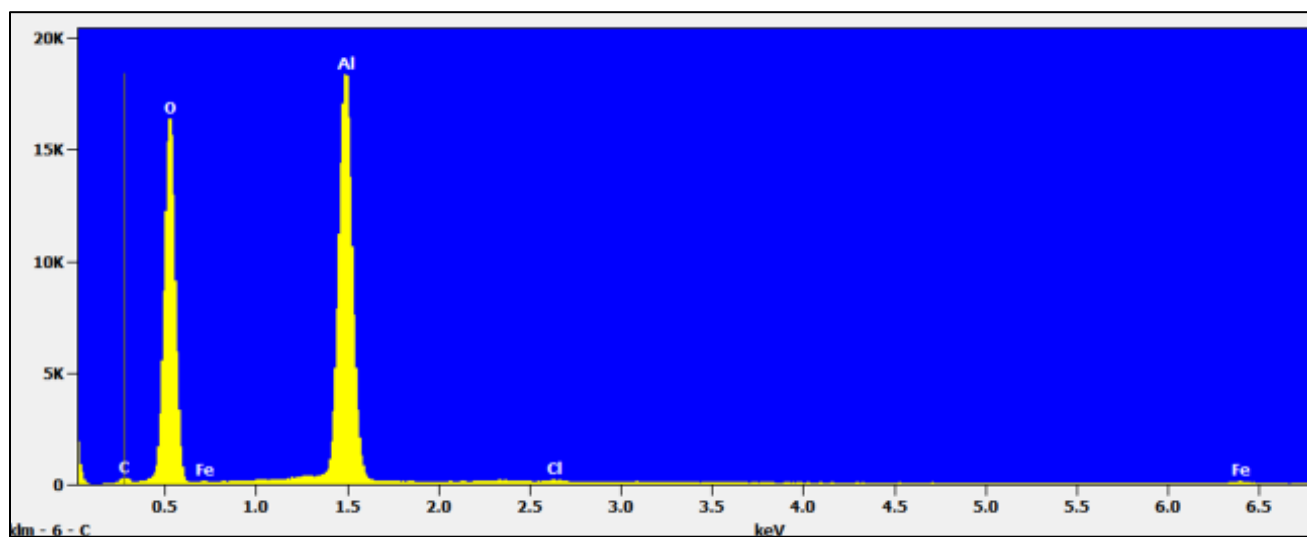


Figure 7 – EDS spectrum of the area in Figure 6, showing high levels of aluminum and oxygen.