

# NATIONAL TRANSPORTATION SAFETY BOARD

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



March 31, 2016

MATERIALS LABORATORY FACTUAL REPORT

Report No. 16-033

## A. ACCIDENT INFORMATION

Place : Atlanta, Georgia  
Date : May 8, 2015  
Vehicle : Piper PA-32R-300  
NTSB No. : ERA15FA208  
Investigator : Eric Alleyne

## B. COMPONENTS EXAMINED

Debris in fuel flow divider

## C. DETAILS OF THE EXAMINATION

The fuel flow divider from the accident aircraft was submitted to the Materials Laboratory for examination. Debris was found in the intake line during the on-scene examination. The debris was collected from the intake line for analysis.

The debris was examined using Fourier-transform infrared spectroscopy (FTIR) with a diamond attenuated total reflectance (ATR) accessory in accordance to ASTM E1252-98 (American Society for Testing Materials E1252-98: *Standard Practice for General Techniques for Obtaining Infrared Spectra for Qualitative Analysis and American Society for Testing Materials*). The spectrometer was used to collect and process infrared wavelength absorbance spectra of the unknown material.

The spectrum for the debris contained spectral peaks that corresponded to particular functional groups found within the molecular structure of the unknown material. The presence of a broad spectral signature spanning from  $\sim 3400$ - $2100\text{ cm}^{-1}$  containing four peaks at  $\sim 2935\text{ cm}^{-1}$ ,  $\sim 2851\text{ cm}^{-1}$ ,  $\sim 2662\text{ cm}^{-1}$  and  $\sim 2548\text{ cm}^{-1}$  corresponds to an oxygen-hydrogen bond with the four peaks extending above the broad peaks corresponding to carbon-hydrogen stretching bonds. A strong single peak at  $\sim 1684\text{ cm}^{-1}$  is indicative of a carbon-oxygen double bond. A single peak at  $\sim 1412\text{ cm}^{-1}$  is indicative of a carbon hydroxyl (C-O-H) bond. A single peak at  $\sim 1282\text{ cm}^{-1}$  is indicative of carbon-oxygen stretching bond. A single peak at  $930\text{ cm}^{-1}$  indicative of hydroxyl (O-H) out-of-plane bend bond. These signatures indicate that the material contains a carboxylic acid.

A spectral library search was done on the debris spectrum. There were no strong matches found in the search, however, the debris spectrum had many similarities

to several dicarboxylic acids such as terephthalic acid and isophthalic acid. Carboxylic acids are pervasive in nature and are often found as precursors in polymer production, in adhesives and coatings and are often naturally present in fuel as well as used as fuel additives (corrosion inhibitors and lubricity improving additives).

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