

Communication Summary

February 27, 2019

Information from: Ms. Nancy McAtee, NTSB Chemist



Summary & Factual Information: Ms. McAtee was sent a magnetic plug from the hydraulic system on N127LN along with an exemplar magnetic plug. The top of the magnetic plug was not recovered in the field. She was asked to examine the accident plug for any material that may be present on it and to characterize it.

She, in part, reported that, "A fractured mag plug from the accident aircraft was submitted to the Materials Laboratory for examination. The top of the fractured area was swabbed with a cotton swab to remove any potential residue present. The swab was examined using a Fourier Transform Infrared (FTIR) spectrometer 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). The spectrometer was used to collect and process infrared wavelength absorbance spectra of the unknown material(s).

In order to isolate the spectrum of any potential residue, the spectrum of the cotton swab was subtracted from the original spectrum collected to remove the background spectral interference. The resulting spectrum for the residue material contained only two discernible peaks. The following combination of spectral peaks correspond to particular functional groups found within the molecular structure of the unknown material. The presence of a doublet peak between ~ 2950 cm^{-1} and ~ 2850 cm^{-1} is indicative of a carbon-hydrogen (C-H) single stretching bond. A single peak at ~ 1740 cm^{-1} is indicative of a carbon-oxygen double bond (carbonyl). Due to the lack of other identifying spectral peaks, the material could only be identified as a hydrocarbon with a carbonyl group. This was likely due to insufficient residue on the mag plug. Materials consistent with this classification include ester-based hydraulic fluids which could be present under normal conditions on the plug.

The swab was also examined using scanning electron microscopy (SEM) and semi-quantitative standardless energy dispersive x-ray spectroscopy (EDS) in accordance with ASTM E1508 (American Society for Testing Materials E1508 Standard Guide for Quantitative Analysis by Energy-Dispersive Spectroscopy, 2008). A small piece of the swab was cut from the swab pad and mounted on carbon tape for analysis. The EDS analysis found only the presence of carbon (C) and oxygen (O). These elements are present in the cotton swab material as well as the residue found in the FTIR analysis."

I can attest that the above summary is correct to the best of my knowledge:

Edward F. Malinowski
National Transportation Safety Board
Air Safety Investigator



Photo 1 – View of the removed hydraulic system magnetic plug during recovery of the helicopter.



Photo 2 - Side view of the removed hydraulic system magnetic plug and an exemplar magnetic plug during the laboratory examination.



Photo 3 - Overhead view looking down at the removed hydraulic system magnetic plug and an exemplar magnetic plug during the laboratory examination.