CASE REPORT

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A Bizarre Death Caused by a Model Airplane

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ABSTRACT: This paper describes examinations conducted on fracture surfaces on the horizontal stabilizer of a large radio-controlled model airplane. This stabilizer separated from the aircraft in flight, causing it to go out of control and crash into a bystander who was casually observing the flight. The bystander suffered a ruptured liver and bled to death internally within a short time. In the course of a subsequent lawsuit, it was revealed that the horizontal stabilizer had broken off the plane in a previous flight and had been repaired. Infrared analysis was used to identify the glues used to effect the repair. Microscopic examinations provided evidence of multiple repairs and demonstrated the poor quality of the repairs. This case emphasizes the importance of a careful visual examination of items of evidence as an adjunct to chemical and instrumental analyses.

KEYWORDS: forensic science, model airplanes, physical evidence, accidents

Large aircraft such as airplanes and airships are known to crash occasionally, usually with fatal consequences for their occupants and frequently for persons on the ground. Model airplanes mimic their larger cousins in a variety of ways, including appearance and performance. It appears that model airplanes can even be as hazardous as their larger counterparts. This paper describes examinations carried out by the author in the course of an investigation of a fatal accident involving a model airplane.

This bizarre episode began benignly enough. A young father was driving with his son on an errand when he chanced to see a radio-controlled model airplane being flown in a nearby field. Being interested in such model airplanes, he stopped the car and got out to watch the flight. Abruptly, the left horizontal stabilizer broke off the aircraft and the plane plunged earthward out of control. The propeller hub of the plane struck the young man in the upper right quadrant of the abdomen. He collapsed and died shortly thereafter. An autopsy revealed that the impact of the crashing model airplane had ruptured the decedent's liver, leading to a fatal internal hemorrhage.

The author was approached by the attorney representing the decedent's widow and asked to examine the airplane, paying particular attention to the broken stabilizer. The attorney had already deposed the owner of the model airplane (a self-insured civil engineer). According to the owner, the port horizontal stabilizer had broken off in an earlier flight; rather than replace the broken stabilizer, he had glued it back together with "white"

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glue or epoxy cement (he was unclear on this latter point). The attorney representing the widow wished to determine the composition of the glue used in order to verify or refute the owner's statements in his deposition.

Materials and Methods

The broken surfaces of the horizontal stabilizer were examined with a Bausch and Lomb StereoZoom 7 stereomicroscope equipped with a Polaroid camera back. Both color and black-and-white photographs were taken of the surfaces at various points.

The initial microscopic examination of the broken surfaces of the horizontal stabilizer revealed the presence of three distinct layers of glue. Small samples of each of these were removed and subjected to infrared spectrophotometric analysis as dispersions in potassium bromide disks. The glue samples were pulverized in a small ball mill and mixed with potassium bromide (BDH Laboratories). The mixtures of glue and potassium bromide were then pressed into disks using a screw-type mini-die (Wilks Scientific Corp.). The infrared spectra of the disks were obtained with a Beckman 4220 infrared spectrophotometer. The infrared spectrum of the "white" glue supposedly used by the owner

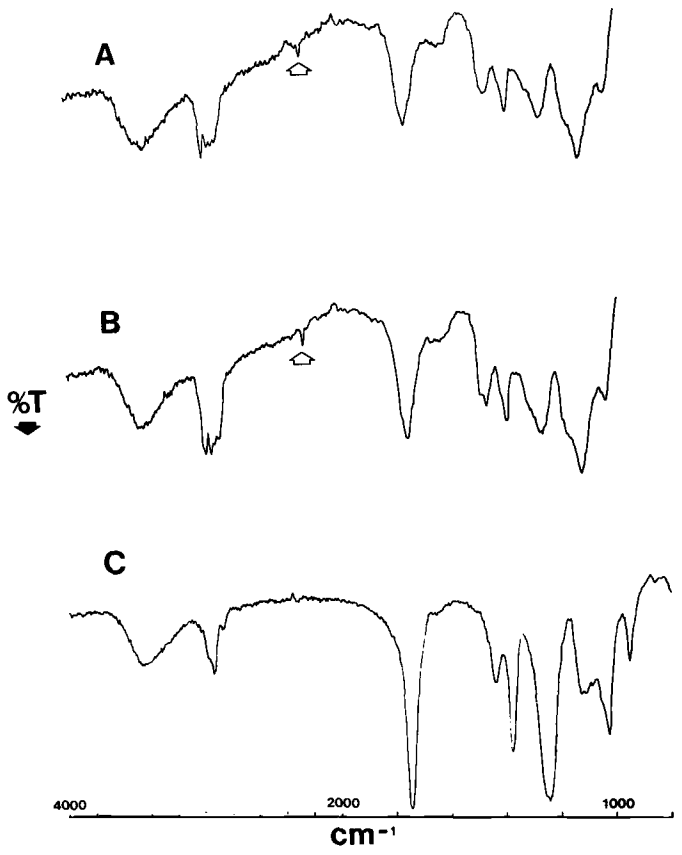

FIG. 1—*Infrared spectra of the three layers of glue from the horizontal stabilizer: A = Layer 1, B = Layer 2, and C = Layer 3. The arrows indicate a 2250 cm^{-1} nitrile stretching band. All spectra were obtained from potassium bromide disks.*

in his repair of the stabilizer was obtained from a smear on a silver chloride disk (Wilks Scientific Corp.).

Results and Discussion

The infrared spectra (Fig. 1) of the glue layers were only moderately informative. The infrared spectrum of one layer (designated C in Fig. 1) matched that of the "white" glue; based on its infrared spectrum, it was identified as polyvinyl acetate [*1*]. The infrared spectra of the remaining layers of glue were the same; moreover, both infrared spectra showed the presence of a band at 2250 cm^{-1}, indicating the presence of nitrile groups [*2*]. The presence of nitrile groups strongly suggested that these layers of glue were composed of a cyanoacrylate adhesive.

The microscopic examination of the broken stabilizer was more revealing. Figure 2 shows the three layers of glue in situ. The mere presence of three layers of glue was very significant. Either the owner of the model airplane had had to repair the broken stabilizer more than once (in which case, he would have been on notice of the likelihood that it would break off in flight, causing the plane to crash out of control) or he had experienced difficulties in effecting the repair (in which case he might reasonably have been concerned about the adequacy of the repair). The poor quality of the repair is indicated by the separation of glue layers 2 and 3. A further indication of the poor quality of the repair work is shown in Fig. 3. This photomicrograph shows one of several man-made fibers that were found embedded in glue on the broken surface of the stabilizer. The fiber shown in this figure was found draped over a series of high points on the fracture surface. The position of this fiber showed that, when the broken surfaces were glued back together, they were, in fact, not brought into close contact in this area. Otherwise, the fiber would have been forced down into the crevices of the broken wood surface.

The ultimate irony in this fatal accident is that the broken stabilizer was simply a piece of balsa wood that could have been replaced with minimal trouble or expense. The widow's suit against the owner of the model airplane was eventually settled out of court.

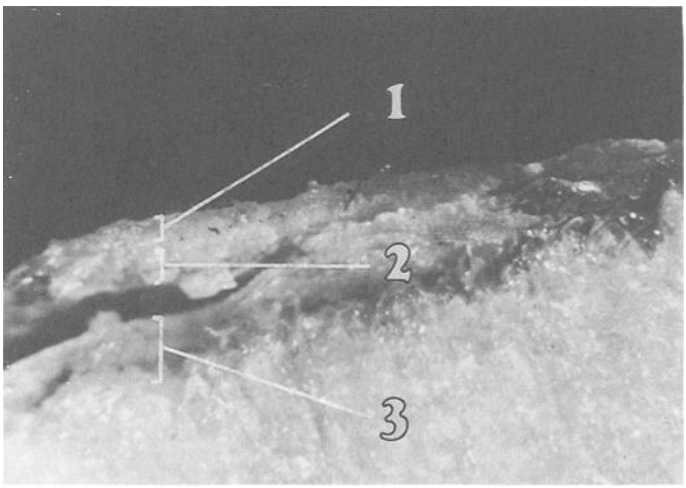

FIG. 2—*Photomicrograph showing the three layers of glue (labeled 1, 2, and 3) in situ on the broken edge of the left horizontal stabilizer. Layer 3 was identified by infrared spectrophotometry as polyvinyl acetate. Layers 1 and 2 were identified as a cyanoacrylate adhesive.*

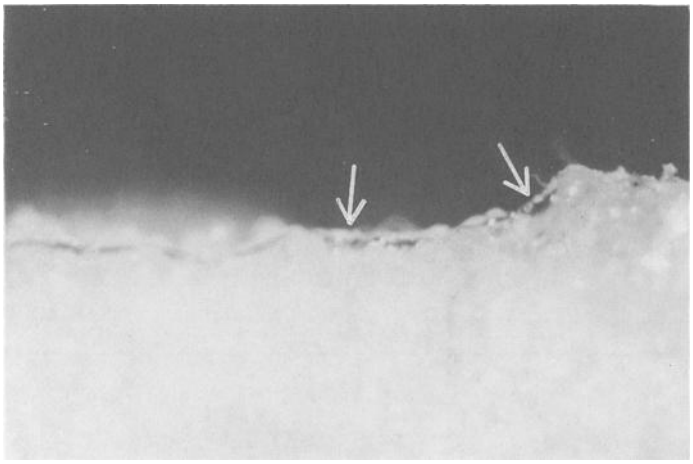

FIG. 3—*Photomicrograph of a man-made fiber (indicated by arrows) on the broken surface of the horizontal stabilizer.*

Summary

Microscopic examination of layers of glue on a broken horizontal stabilizer from a model airplane involved in a fatal accident revealed evidence of multiple repairs and demonstrated the poor quality of the repairs carried out by the owner of the airplane. This illustrates the importance of a careful visual examination of items of evidence as an adjunct to chemical or instrumental analyses.

References

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