



THE FORENSIC ENGINEERING REPORT

I-ENG-A® [IN-JUH]

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A \$3 ITEM.....A \$90,000 LOSS

HAVE NO FEAR... DEZINKIFICATION IS HERE

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Let's see now....hmmm? That works out to odds of 30,000 to 1. A ratio of 30,000:1 is much better than the average lotto odds but not so great for the insurer. When someone, somewhere, uses an incorrect pipe fitting costing \$3 and the use of the incorrect fitting results in \$90,000 damages it is surely not a happy day.

In this case the incorrect pipe fitting cost only \$3 dollars. As it happens, the correct pipe fitting also would cost only about \$3. Both pipe fittings look very similar, either as common ordinary brass or bronze. The reason for use of the incorrect fitting is unknown but not likely related to the cost of the fitting since both cost about the same. Most probably

the use of the incorrect fitting was a simple matter of inexperience on the part of the person doing the installation of the sea strainer. What does matter is where and how the fitting was used.

The background to this 30,000 to 1 loss has to do with a \$1,000,000 sailing yacht. This very nice yacht has an auxiliary motor for times of non-sail propulsion. This auxiliary motor is cooled by seawater that is drawn into the engine cooling system through a sea strainer. Mounted next to the outer hull of the vessel and below the water line, a failure of the sea strainer that allows water to enter unrestricted could cause the yacht to flood or even sink. In this event

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THE AUTOMOTIVE EDR: OPENING PANDORA'S BLACK BOX BY: PROFESSIONAL INVESTIGATIVE ENGINEERS, INC. (PIE)

The Automotive EDR ("Black Box") has been the subject of much scrutiny over the course of the last few years. Many are skeptical of the accuracy of such a device; even more are outraged at the possibility of being "spied" upon by this technology. The latter concerns, while an interesting topic of discussion, will not be addressed in the context of this article. The former, regarding concerns of the accuracy and applicability of EDR data, have been brought to the attention of the authors on numerous occasions by numerous people. PIE decided that a hands-on evaluation of EDR was necessary in order to address these concerns.

The idea was simple: conduct a controlled crash test with the intent of comparing the EDR data to that of more "traditional" reconstruction techniques, and invite as many representatives of the insurance

and law-enforcement industries as possible. The test was completed at the Colorado State Patrol ("CSP") Driving Track in Golden, Colo., with representatives from the CSP, the Colorado Division of Insurance, and various other insurance providers present for the test.

The purpose of the test was to evaluate an EDR in action, comparing the results with more typical vehicle accident reconstruction methods in order to gain a better understanding of the accuracy of the EDR data. The results of the test would speak for themselves, allowing PIE's non-engineering counterparts to witness firsthand how the EDR data is acquired and utilized during an accident reconstruction. A sample of the test results are displayed in Table 1.



Image of the 90-degree impact of the test vehicle with the target vehicle. Note the inflated driver's airbag.

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A \$3 ITEM A \$90,000 LOSS CONTINUED

(Continued from page 1)

a pipe fitting broke away from the sea strainer thus allowing water to enter the vessel. The vessel consequently flooded resulting in \$90,000 in damages to pumps, motors and other equipment located in the bilge area of the vessel.

Our assignment at Trnka Engineers Co. was to determine the cause of the fitting failure. The cause of the failure could possibly provide the basis for subrogation of the claim. The evidence, the sea strainer and pipe fitting, was provided to us by the adjuster as seen in Photo P-1. The broken fitting location is indicated by the red arrow.



Photo P-1

A quick 10x magnification inspection of the broken pipe fitting gave us cause to suspect that a brass pipe fitting was used in the sea water cooling system where bronze, a more appropriate pipe fitting material, should have been used.

There are many copper based alloys, however, only a few are suitable for extended exposure to salt water. Copper alloys with relatively high zinc content when exposed to salt water will succumb to a phenomenon termed “selective leaching” or otherwise known as “dezincification”. The phenomenon in this case is that the zinc, in constant contact with salt water, goes into solution with the sea

Sea Strainer Pipe Fitting Failure



Photo P-2

water and over time leaches out of the pipe fitting. As one would easily conclude the zinc eventually dissolves out of the pipe fitting leaving only the copper base material along with some trace elements. This remaining material is very brittle and fractures easily as occurred in this situation.

A closer view is seen in the Photos P-2 and P-3. Note the “spongy” appearance of the fractured pipe fitting surface in Photo P-3. The spongy appearance occurs with the migration of the zinc out of the copper base material of the pipe fitting.

Sufficiently certain of our suspicion of the cause and origin of the failure of this pipe fitting we employed the services of a competent laboratory to complete a chemical analysis of the pipe fitting and sea strainer body.

The laboratory findings did indeed confirm the fitting to be brass and dezincification did occur as a result of exposure to sea water. This finding was then reported to the adjuster who now had opportunity to subrogate back to the yacht builder.

Note the “Spongy” Appearance

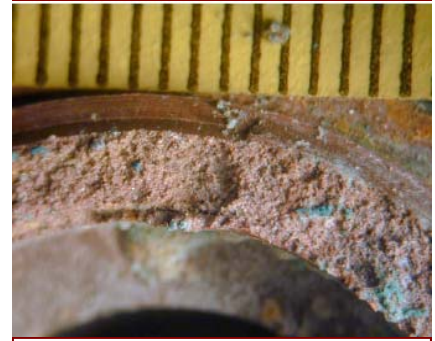


Photo P-3

The commentary contained in *The Forensic Engineering Report* is not intended, nor should it be relied upon, to replace specific professional advice. We recommend that readers consult their professional advisors regarding issues raised in this publication.

COMEDY RELIEF CORNER

A man is flying in a hot air balloon and realizes he is lost. He reduces height and spots a man down below. He lowers the balloon further and shouts, "Excuse me, can you tell me where I am?"

The man below said, "Yes, you're in a hot air balloon, hovering 30 feet above this field."

"You must be an engineer," said the balloonist.

"I am," replied the man. "How did you know?"

"Well," said the balloonist, "everything you have told me is technically correct, but it's of absolutely no use to anyone."

The man below said, "You must be in management."

"I am," replied the balloonist, "but how did you know?"

"Well," said the man, "you don't know where you are, or where you're going, but you expect me to be able to help. You're in the same position you were before we met, but now it's my fault."



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THE AUTOMOTIVE EDR: OPENING PANDORA'S BLACK BOX

The results of this test illustrate that the EDR data saved within the subject vehicle is of extreme value to the investigator. When compared with the more traditional reconstruction techniques, it can be seen that the EDR data is indeed an accurate representation of the facts of the case. Obviously, the investigator does not typically have the luxury of a police laser to confirm his findings. However, the presence of EDR data during the analysis of a case allows for an additional set of data that can be compared with other results.

Regarding the potential usefulness of EDR data, it must be noted that it is not a stand-alone reconstruction technique. The data, while proven to be reliable and accurate, can and must be used in conjunction with a *complete* accident reconstruction. There are various examples, beyond the scope of this article, which illustrate the need for interpretation of the data regarding a specific automobile accident. The best and most effective use of the data is to perform a "traditional" accident analysis and use the EDR data as a support for the conclusions found therein (a methodology similar to that described in the PIE test above). In short, black boxes *do not* and *cannot* replace a human accident investigator.

Method	Delta-V (MPH)	Calculated Pre-Crash Speed (MPH)
Momentum Analysis	15.5	41.5
Vehicle Crush	15.1	41.1
EDR	14.9	40.9

Table 1: Crash test summary data. Note that the in-car speedometer read 43 MPH and a police laser gun read 42 MPH just prior to the collision.



A sequence of in-car images taken during the crash test. Note that both driver and passenger airbags were deployed, protecting the otherwise vulnerable crash dummy from an uncertain fate. No dummies were harmed in the creation of these images.

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RECENT USPC PRODUCT RECALLS

According to the U.S. Consumer Product Safety Commission, deaths, injuries and property damage from consumer product incidents cost the nation more than \$700 billion annually. Below is a sampling of recent recalls.

Philips Consumer Electronics Recalls Plasma Flat Panel Televisions

Plasma Flat Panel Televisions with Ambilight Feature: Consumers should stop using the Ambilight feature immediately unless otherwise instructed. For more information, contact Philips at (888) PHILIPS - Consumers also can go to the firm's Web site at www.philips.com



P3 International Recalls IonizAir™ Air Purifiers Due to Risk of Fire

P3 has received 10 reports of purifiers melting or catching fire. No injuries have been reported. The recall involves model number P4620 with lot numbers beginning with either 03 or 04 or having no lot number. For additional information, contact the firm (888) 734-0449 or visit the firm's Web site at www.getnewcartridge.com



J.C. Penney Recalls Shag Rugs Due to Fire Hazard

"Alyssa" Shag Rugs. The rugs fail to meet federal standards for flammability and could ignite, posing a risk of fire and burn injuries to consumers.

Fisher Controls International, Inc. Recalls Gas Regulators

Model HSR natural gas regulators and various models of LP-gas regulators. Gas can leak from regulator's flanges when flange screw heads break, posing a fire or explosion hazard to consumers.



Fluorescent Ceiling Light Fixtures Sold Exclusively at Home Depot Recalled by Lithonia Lighting Due to Shock Hazard

Sold: Exclusively at Home Depot stores from June 2007 through August 2007 for about \$40. For additional information, contact Lithonia Lighting toll-free at (800) 638-or visit the www.lithonia.com



Salton Inc. and QVC Recall Electric Toasters Due to Fire Hazard

Cook's Essential Electric Toasters. The toaster can turn on without bread in the slots and ignite items placed on top of it, posing a fire hazard.



Note: There are 16 new toys and items listed as having lead paint hazard alone for October 2007. Check your children's toys!

Toshiba Recalls AC Adapters sold with Portable DVD Players Due to Burn Hazard

This recall involves the AC adapter sold with the Toshiba portable DVD player Model SD-P1600. "Toshiba" and ADPV16 can be found on the side of the adapter. For additional information, contact Toshiba Customer Solutions at (877) 290-6064 or visit www.tacp.com



Dollar General Recalls Tumblers Due to Violation of Lead Paint Standard: Surface paint on the center of the eyes of some of the cups can contain high levels of lead, violating the federal lead paint standard. Contact Dollar General at (800) 678-9258 or visit www.dollargeneral.com



Honeywell Recalls Gas Valves Used in Decorative Fireplaces and Stoves Due To Burn Hazard—Honeywell at (800) 939-4836

www.nvp-hearth.honeywell.com

Picture of only one of the models:



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