The Consultant

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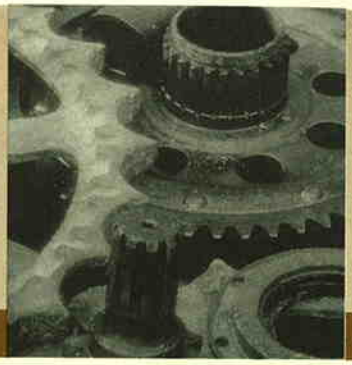
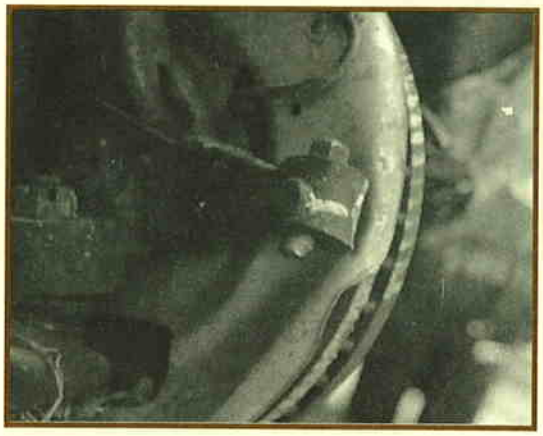


What is MFA?
When related to this kind of analysis, MFA means using scientific methodology and principles to determine the most likely cause of a failure when it occurred, and the influence (if any) of that failure on a loss of vehicle control.

Tools of the Trade:
Mechanical Failure Analysis

Can a mechanical failure analysis (MFA) determine whether a steering component failed before or after a vehicle ran off the road into a concrete culvert? The answer is usually yes. It helps when the vehicle evidence is preserved relatively unchanged and the scene evidence is at least photographed, especially on-road tire marks, which are likely to disappear due to traffic and/or weather. What can the appearance of a steering component, such as a ball joint, tell us about when and how the failure occurred and how this influenced vehicle steering? For example, a failure in a steering component, which appears deformed and has impact witness marks, as shown in this photo, likely failed as a result of an accident and did not fail causing the vehicle to leave the roadway. Most people would probably agree that failure of a component, which transmits the steering wheel rotation to the front wheels, might cause a loss of steering control. But, that would only be a cause if the failure occurred while the vehicle was driving down the road in a normal manner.



A ball joint stud deformed and fractured - note the impact witness marks.

In addition to the vehicle evidence, other input must be reviewed. What does the driver or witness say they saw, heard, or felt? What does the scene evidence indicate about the orientation of the vehicle? Was the angle of departure gradual or steep? Did the vehicle leave the road with side slip or with rotation? Was there a road curve near the point where the vehicle lost control? Scene evidence and basic speed analysis are usually very helpful in confirming a mechanical failure analysis, and they should always be evaluated. A mechanical failure analysis of vehicle components alone does not tell the whole story - and may lead to the wrong conclusion(s).

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IN THIS ISSUE:

Lightning Damage... Or Fraud?

What Is Lightning?

Lightning is the conduction of electrical charge from a cloud to the ground (or water) and from the ground to a cloud.[1] When moisture and particulate matter in the air are moved around violently, charges develop on these particles. Generally, during a storm, the larger, less dense particles obtain a net positive charge and are lifted to the top of the cloud structure. The smaller, dense particles obtain a net negative charge and tend to drop to the bottom of the cloud. When a sufficient amount of charge develops, lightning is the result. For the curious, the flash is typically comprised of different types of discharges. First, a series of stepped leaders establish the flash channel from the cloud to the ground; this connected leader is followed by a return stroke from ground to cloud. Once the channel is established, a set of about 4 to 20 dart leaders and return strokes use the channel until the charge is dissipated. The strike appears to flash because each of

Why The Interest In Lightning?

There is no question that lightning strikes result in property damage. Questions arise when the nature of the damage is considered. Damage sustained from lightning or other high voltage discharges is not typically well understood. Therefore, it often pays to obtain an informed and experienced opinion about the nature of the damages. Losses can be real where the damage was indeed caused by lightning. However, the loss may be a fraud. Fraud occurs when the damage is real and not covered, but attributed to a covered cause. Opportunistic fraud results when the damage was made to appear as though caused by lightning.

"Opportunistic fraud results when the damage was made to appear as though caused by lightning."

Lightning (Cont. from page 2)

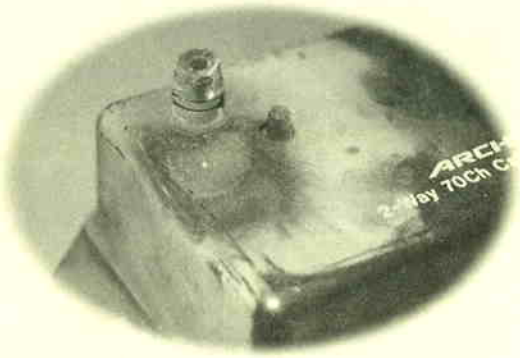
these leaders and strokes are discrete and take about 20-50 milliseconds to occur. On top of that, our persistent vision intensifies this flickering or flashing effect. Channel current ranges from about 40,000 amps to more than 250,000 amps. Just about everyone has seen trees or building walls blown apart from the effect of water or metal vaporizing under the effects of this current. The damage can be microscopic from induced currents or transmission to remote locations along wires and pipes.

Damage From Lightning?

Since lightning can cause destruction on both large and microscopic scales, it is not surprising that lightning would be blamed for a variety of damage. Because lightning is not yet well understood outside research and product circles, there are temptations to blame lightning when other obvious factors are not present. Worse, the effects of fraud are rampant where the cause is not well known.

What You Can Do?

If a loss is blamed on lightning, SEAL can use its technical personnel and access to national lightning databases to characterize the environment at the time of the loss. An inspection and evaluation



The result of lightning striking the antenna, the electric charge traveling through the wires, and damaging the cable amplifier box on the television.

of the damage is indicated anytime the amount of loss exceeds a prudent threshold or indicators of fraud exist. Contact SEAL if you have questions about real or fraud losses due to lightning.

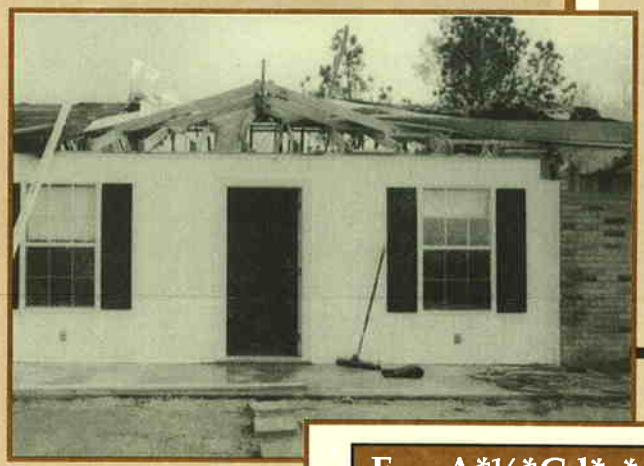
[1]Martin A. Uman, *Lightning* (Mineola, NY: Dover Publications, Inc.), 1-2.

Simple Wind Force Calculation

Have you ever wondered what kind of force the wind could create when impinging a wall, chimney, door or other flat object? The answer is not simple without complex recreation of the conditions at the time; however, a close approximation of a perpendicular wind-induced force can be calculated fairly easily. Taking that force and determining stress and failure are the natural next steps in a failure analysis due to high winds.

If you know the velocity (v) of the wind, the area (A) of the surface the wind is acting across, the coefficient of drag (Cd) and the density of the air (r), the approximate force can be calculated.

The dynamic pressure is $\frac{1}{2}*Cd*r*v^2$. The drag force due to the dynamic pressure is the product of pressure and area. Therefore the force from a perpendicular wind is $F = A*\frac{1}{2}*Cd*r*v^2$.



Structural damage due to high tornado winds - the sheet metal roofing ripped off the front porch roof.

NOW, FOR AN EXAMPLE: A 100 mph (114.7 ft/sec) wind acts on a 1 ft^2 area of a wall, assuming a flat plate and sea level conditions, the force is calculated at $1*\frac{1}{2}*1.28*0.002265*114.7^2 = 19$ lbs.

$F = A*\frac{1}{2}*Cd*r*v^2$

- A = area (ft^2)
- Cd for a flat plate is 1.28
- r = air density, typically (0.002265) at sea level (slugs/ft3)
- v = velocity (ft/sec)