SINTRA
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**FIRE INVESTIGATION**

# *Where Persistence is a Virtue*

Fire investigation may appear as a mystery to some, but there is a thorough set of rules we try to follow as engineers/investigators when examining a fire. These rules include surveying the scene, narrowing in on the area of origin based on burn patterns and witness evidence, pinpointing the point of origin, identifying all possible causes in the area of origin, and ruling out any unlikely causes. Fires can be difficult to analyze due to the varying performance characteristics of materials when exposed to fire and if left alone for an extended period of time, fire tends to destroy the evidence. Often, identifying the area of origin is not nearly as important as determining the cause. However, without the area of origin, a cause can rarely be found.

The cause of a fire is a function of a source of heat, spark or flame combined with adequate ventilation and a competent fuel. Natural sources of ignition in a house include electrical and mechanical appliances, distribution wiring, candles, cigarettes, and, occasionally, auto-ignition of self-drying oils such as those found in some paints. All of these devices will leave a trail behind for the engineers/investigators to discover, read, and interpret—they just have to find it. A careful evaluation of the materials found in the area of origin will allow the engineers/investigators to find the potential ignition source, air supply and competent fuels that could have started the fire.

As part of conducting a thorough analysis of a fire scene, I was taught to always stay fifteen to thirty minutes past the point when I think my investigations is complete, particularly for investigations that do not appear to be resolvable. There have been times at a fire scene when it appeared the cause of the fire could not be determined, but further scrutiny lead to the discovery of the cause. Often by continued examination, you will find the cause or the missing piece of the puzzle that links everything together.

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I recall an incident where we ended up finding a travel iron and ironing board, which was the cause of a fire in a motor home. The two pieces matched and showed a clear burn pattern consistent with a cause of a fire. When the file was originally assigned, the fire was believed to have been caused by a problem with the furnace. In the end, it turned out that some family friends had been ironing. The iron had been inadvertently left on and burned into the ironing board; there was no problem with the furnace.

**"WE PRIDE OURSELVES ON INVESTIGATING COMPLEX FIRES FOR CLIENTS WHO NEED TO KNOW WHAT REALLY HAPPENED AND WHY."**

In another incident, we found an arced section of wire in a vehicle fire in the area where the vehicle was severely damaged. The vehicle had been exposed to a previous fire and suffered exposure damage that had not been properly checked and repaired prior to being put back into service. As a consequence, the insurance company was concerned they had an arsonist on their hands. After careful examination of the vehicle, the arced section was discovered and identified as the cause of the fire. However, further investigation of the fire damage revealed that the previous fire exposure was the actual cause of the fire.

Care and diligence are the hallmarks of a good engineer/investigator. Expensive gadgets and gossip rarely help in determining the cause of a fire. At Sintra Engineering, we pride ourselves on investigating complex fires for clients who need to know what really happened and why.

**ACCIDENT INVESTIGATION**

# *"I Barely Touched Him!"*

"I barely touched him!" This statement is frequently heard when a driver describes the severity of the low speed rear-end collision he or she caused. Although you would love to believe your client or insured, you still need to determine the severity of the collision.

Low speed impacts are generally defined as collisions that result in little or no damage to the vehicles involved and can be grouped according to the vehicles' orientation at impact. These groups are rear impacts, frontal impacts, lateral (side) impacts, and sideswipe collisions.

In order to assess the severity of a minor collision, the extent of vehicle damage and orientation of the vehicles at impact must be assessed. To do this, the vehicles are examined so that the sustained damage relevant to the collision can be documented. However, due to the minor nature of these collisions, there is rarely any evidence from the scene of the accident and vehicle damage offers limited information regarding the vehicles' impact orientation. Therefore, witness statements provide the vital missing information to confirm orientation. If two vehicles' bumper systems are offset or angled during a collision, damage will typically appear more significant than if two vehicles were aligned at impact. Without some indication from witness statements, the impact severity can be incorrectly over-assessed if the wrong impact orientation is assumed. The bottom line is the better the information, the better the result.

Brief statements regarding orientation provided by involved parties

# FORENSIC ENGINEERING

are helpful; statements regarding damage, however, are not particularly useful. The most common statement is, "There is no damage to my vehicle." This rather subjective statement understates the damage. In most cases, a closer inspection will reveal light scuffing or other minor indications of an impact. Furthermore, the bumper systems of many newer vehicles are designed to withstand impacts where the change in velocity 10 km/h or greater will not exhibit any obvious visible damage. In a recent collision case, a 1998 Buick Park Avenue had no obvious visible damage after sustaining a change in velocity greater than 10 km/h; however, a closer look revealed scuff marks on the bumper cover. To investigators, the more the information, the better the assessment.

**The following list provides a good starting point for any detailed investigation:**

- Year, make, model and Vehicle Identification Number (VIN) of the involved vehicles;
- Repair appraisals or work orders for the involved vehicles;
- Notes and photographs of any pre-existing damage on the vehicles;
- Number of occupants in each vehicle and, preferably, their age, sex, and weight;
- Weight of additional cargo in the vehicle;
- Police data including reports, sketches, measurements and notes;
- Signed statements of occupants and witnesses.

## Sintra Engineering is a leader in forensic engineering and maintains our reputation for quality service by providing:

- Comprehensive Technical Investigations
- Timely Reporting on Assignments
- Plain English Reports
- Competitive Rates and Fees
- Peer Review Process (Quality Assurance)
- Thorough Documentation
- Court Qualified Experts
- Single Sourcing for all Engineering Requirements

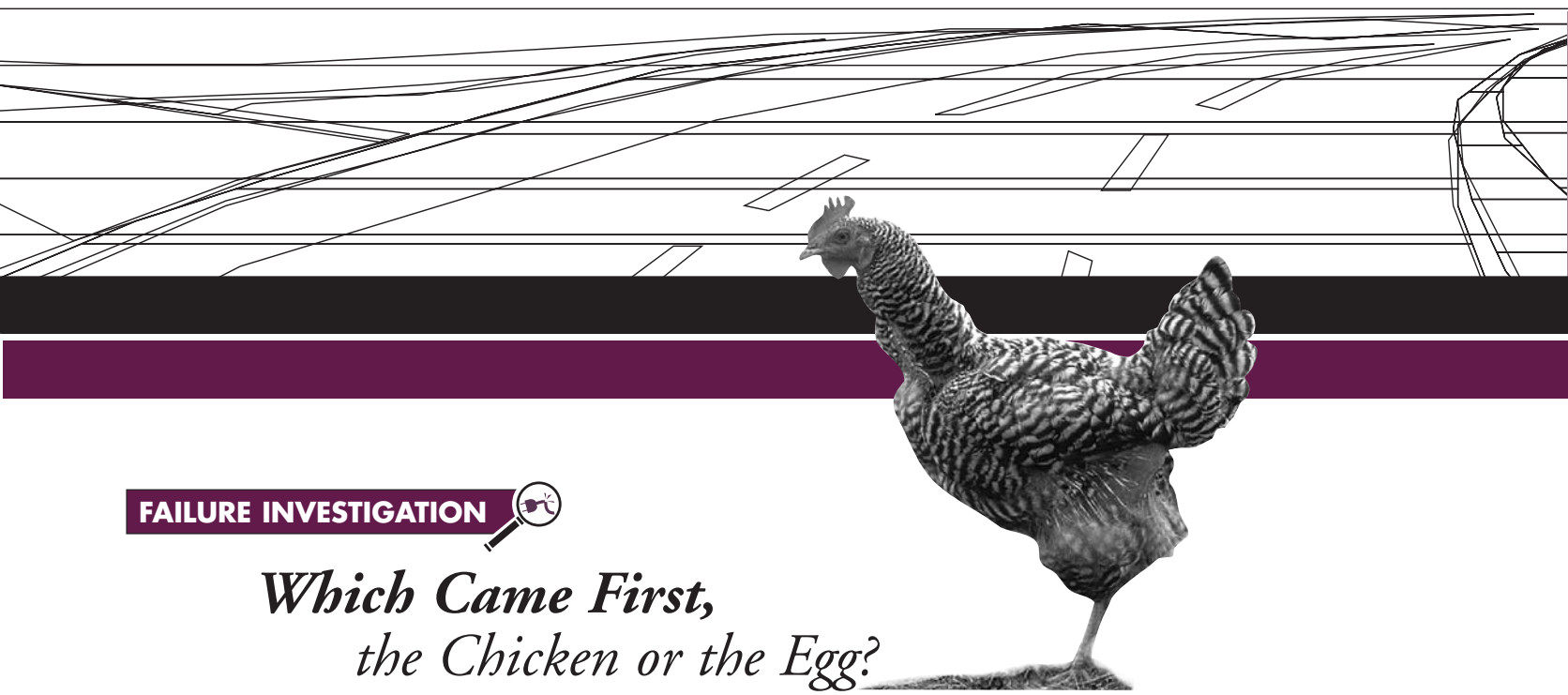
## EMPLOYEE PROFILE : ANDREW HAPPER P. ENG.

- Start date with Sintra: Sep 17, 2001
- Bachelor of Applied Science, Mechanical Engineering, U.B.C., 1996
- Enjoys playing poker and snooker.
- Loves to ballroom dance, skateboard and snowboard.
- Competed in Calgary's Lake Chaparral Triathlon this summer.

Andrew joined Sintra Engineering in 2001 with over five years of practical experience as a forensic engineer with a consulting engineering firm in Vancouver, BC. Since 1999, Andrew has co-authored six research papers with the Society of Automotive Engineers (SAE) on different aspects of collision reconstruction and has presented the results of his research at the SAE World Congress in Detroit, Michigan.

At Sintra Engineering, Andrew plays a senior role specializing in motor vehicle collision reconstruction and developing innovative methods of analysis. Andrew is currently spearheading a research project that will provide valuable data for reconstructing low speed collisions involving vehicles with modern bumper systems.

As a youngster, Andrew thrived on mystery novels, spy stories and solving problems. It didn't take long for him to figure out that forensic engineering was a line of work that he really enjoys. He is now living his childhood dream and enjoys the challenges that he encounters with each new case.

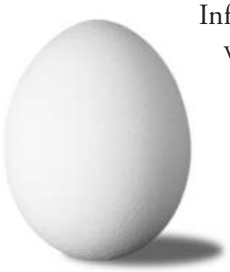


**FAILURE INVESTIGATION**

# *Which Came First,* *the Chicken or the Egg?*

Failures can be a great thing. Okay, the New Coke wasn't such a great thing and the designer of the Pinto should have been fired long before the first body panel was ever stamped, but from a forensic engineering perspective, failures can be great things. Insurance companies over the years have seen the best of failures, as they can often be associated with a monetary loss. The problem then arises—why did the failure occur and what were the contributing factors? Sometimes it can be as simple as a user error such as John Doe neglecting to put oil in his car engine and the engine dies. Sometimes it can be a fundamental design problem caused by the person or people who designed the Ford ignition switch that caused many vehicle fires. Determining the cause of failures can be challenging and often seem like an impossible task.

A common question from insurance companies regarding failures comes from comparison to the eternal question…which came first, the chicken or the egg? For example, a driver involved in a rollover accident indicates that just prior to the accident, he saw the left rear wheel on his vehicle come flying off and attributes the flying wheel as the cause of the accident. Trying to prove this as the cause requires more information and analysis than a dislodged wheel and the driver's statement. Perhaps the wheel came off because of the accident, which was caused by something else entirely. A forensic engineer can help assist in this determination. Using metallurgical analysis techniques, engineers can assess the mode in which the wheel failed such as sudden torsional overload, bending overload, or fatigue; any of these failures would indicate a particular cause.



Information from the vehicle and accident scene along with this metallurgical analysis should yield subsequent conclusions that will assist or potentially rule out further action such as litigation.

It seems to be all too common a question, "The (blank) failed and we need to know whether it occurred before, during, or after the incident." Sintra Engineering has investigated many of these scenarios for vehicles and industrial and household equipment. The truth is…things fail everyday; sometimes it is because of misuse of the product by the end user, sometimes it is due to improper design, and sometimes it is a result of conditions outside human influence. With sufficient information gathered from the failed component and the interrelated pieces, the sequence of events leading to a failure can be determined. As a consequence, defects in materials and designs can be identified and false claims can be dismissed. Wheels will continue to dislodge from moving vehicles, airbags will deploy at low speeds, in-floor heating systems will leak, and brake systems will fail to brake; fortunately, forensic engineering investigations into the causes of failures are usually easier to resolve than the proverbial 'chicken'.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