

## **When things break**

As forensic analysis professionals, we have had a lot of experience with the tragic aftermath of incidents when things break. In the lawsuits that often follow, the important question is, “Who is responsible?” In order to get to this important conclusion, a good forensic scientist must consider all the circumstances.

When things break there is not always an easy answer as to the cause. Suddenly there are thousands of people that can have potentially played a role. The folks who designed the device can certainly have cut corners where they shouldn't have; the folks who manufactured the device could have used the wrong material or process, the folks in charge of packaging, storage, the shippers – the list goes on and on and includes anyone who touched the device or any component of the device from the time of its' creation and up until the time of it's failure. When performing a proper investigation, you need to have the professional engineering skills to actually perform just about every task that each and every one of those participants performs. A good investigator must have the formal training and the real life experience in design, test, manufacturing and analysis and many other fields, to truly piece together what happened.

When things break, there are a lot of physical clues, above and beyond the obvious, that can play an essential role in an investigation. There are shards laid out in patterns, there are tell tale cracks, corrosion marks, grain structures, air pockets, scuff marks, discolorations and many other tell tale signs on concrete, glass, steel, wood and any and all materials that devices are made of. It takes an engineer who has been trained and tested in the math and science that is required to design products to understand and find out when and why they fail.

When things break it is often tragic. Care must be taken to be discrete and sensitive to those who may be involved. However, the information needed to diagnose and analyze the situation may have to come from the victim, the victim's family or other folks involved. The human story is often a very important part of an accident or product failure. It is important to know that although science plays a huge role, in the final analysis it is the human interaction with the science that is most important. For example, a jet engine on a flight of a well known airline failed. Luckily the pilot was able to land safely. Upon inspection, it was found that there was a turbine blade failure. A turbine blade is a highly engineered component of a jet engine that is critical to its function. The material of a jet engine turbine blade has to be made to very high standards for it to function in the intensely hot and corrosive environment. Upon a lengthy investigation it was found that the blade in question was not from a certified source. A compromise had been made based on the high price of turbine blade material to use cheaper stuff. This is very common. It is well documented that way back when the Brooklyn Bridge was built by the Roebling family the engineers sized the components larger than their calculations showed because they knew that there was a good possibility that due to corruption and graft 20% of the material would be sub standard. In the case of a turbine blade and a jet engine the complete understanding of the failure can only be obtained once you examine

debris from an engine, and when you get the human story of who maintained the engine with inferior parts. When things break, there is not always an easy answer as to the cause. Suddenly there are thousands of people that can have potentially played a role. The folks who designed the device can certainly have cut corners where they shouldn't have; the folks who manufactured the device could have used the wrong material or process; the folks in charge of packaging, storage, the shippers – the list goes on and on and includes anyone who touched the device or any component of the device from the time of its creation and up until the time of its failure. When performing a proper investigation, you need the professional engineering skills to actually perform just about everything that each and every one of those participants performs. A good investigator must have the formal training and the real-life experience in design, testing, manufacturing and analysis to truly piece together a cogent explanation as to why the thing broke.

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When things break it is often tragic. However, the information needed to diagnose and analyze the situation may have to come from the victim, the victim's family or other folks involved. Care must be taken to be discreet and sensitive to those who may be involved. The human story is often a very important part of an accident or product failure. It is important to know that although science plays a huge role, in the final analysis it is the human interaction with the thing that is most important. For example, a jet engine on a well-known airline's plane failed. Luckily the pilot was able to land safely. Upon inspection, a turbine blade failure was found. A turbine blade is a highly engineered component of a jet engine that is critical to its function. The material of a jet engine turbine blade has to be made to very high standards for it to function in the intensely hot and corrosive environment. Upon a lengthy investigation it was found that the blade in question was not from a certified source. A decision had been made, based on the high price of turbine blade material, to use cheaper stuff. This is very common. It is well documented that back when the Brooklyn Bridge was built by the Roebling family the engineers sized the components larger than their calculations showed because they knew that there was a good possibility that due to corruption and graft 20% of the material would be sub-standard. In the case of a turbine blade and a jet engine, the complete understanding of the failure can only be established once you examine debris from an engine, and when you get the human story of who maintained the engine with inferior parts.

When things break it can be important to investigate as soon as possible after the incident. This can keep valuable evidence and data from being lost. In a case involving a slip and fall, a woman was injured. A few days later the entire walkway was demolished and all the tiles were discarded. Due to the diligence of our forensic analysis team, a sample of the walkway was collected before it could be disposed of.

The dimensions of accidents, the various processes used to produce the product or situation, the people involved, the material, the physics, the circumstances, are all considered to determine that final conclusion, who is responsible. It's important to have a good working relationship with a forensic scientist before an incident occurs. In this way, as soon as something happens, professional investigators can be deployed to a scene before it is altered. When things break a good forensic investigator who takes into account all the key dimensions will be able to render a quality conclusion.