

# HINDENBURG EXPLOSION

## Cause Map

### The Importance - and Difficulty - of Validating Evidence

Since the Hindenburg explosion in 1937, theories have abounded on what caused the leaking gas and spark that doomed the airship and dozens of passengers. A team at the South West Research Institute has set fire to, and blown up, scale models, and studied archive footage and eyewitness accounts. The team now believes they have determined what happened.

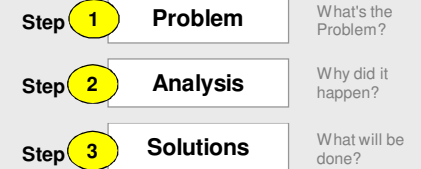
"I think the most likely mechanism for providing the spark is electrostatic."

Jem Stansfield, aeronautical engineer

Cause Mapping is a Root Cause Analysis method that captures basic cause-and-effect relationships supported with evidence.

## CAUSE MAPPING

Problem Solving • Incident Investigation • Root Cause Analysis



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In December, 2012, new evidence was presented to discuss the most likely cause of the Hindenburg explosion. Yep, that's right. 76 years after the original explosion, evidence is still being gathered to help determine what really caused the explosion that killed 36 people.

## 1 Problem

What When	Problem(s)	Hindenburg explosion, crash; 36 people killed
	Date	May 6, 1937
	Time	7:25 p.m.
Where	Differences	Hydrogen-fueled airship
	Physical Location	Lakehurst, NJ Naval Base
	Unit/Process/Equipment	Airship
	Work/Task Being Done	Dropping anchor ropes/landing

### Impact to the Goals

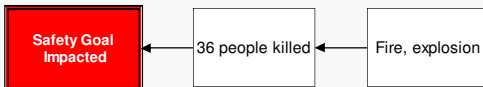
Safety	36 people killed
Environmental	N/A
Cust. Service	Severe loss of popularity of airships
Production-Schedule	
Materials, Labor	Loss of Hindenburg

Frequency	20 airship fires & explosions from 1902-1937
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## 2 Analysis

**Basic Level Cause Map** - Start with simple Why questions.

**Basic Cause-and-Effect**



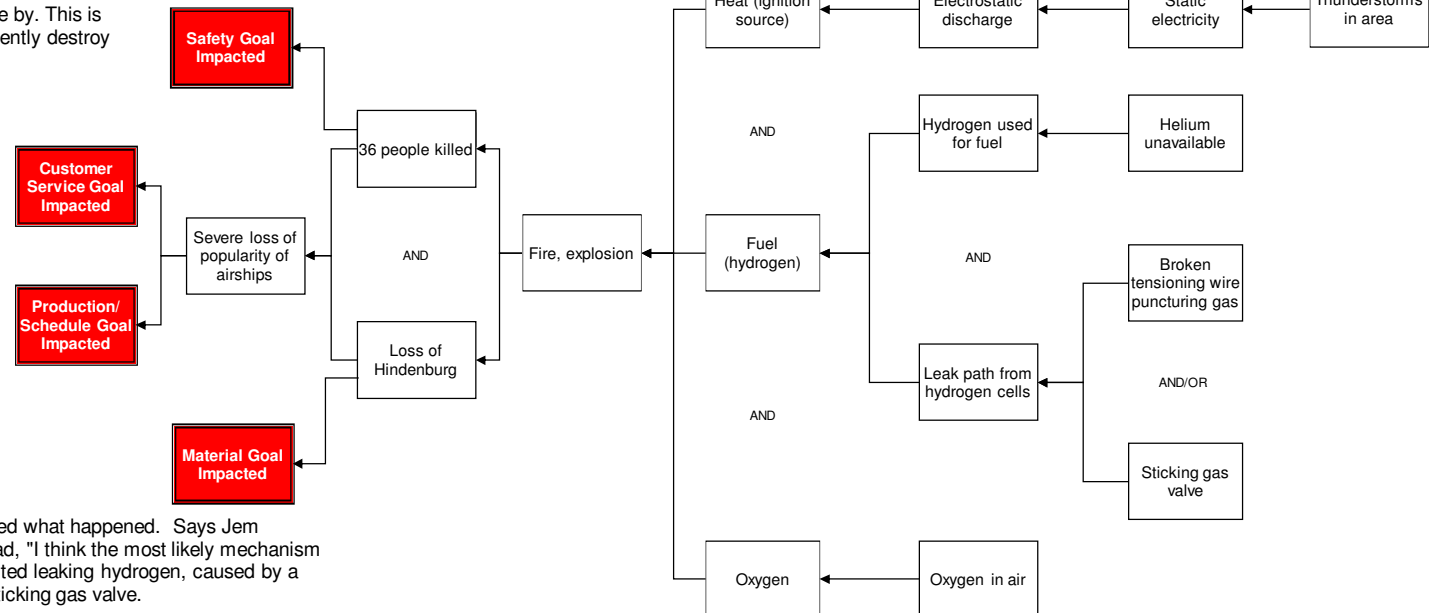
The explosion of the Hindenburg killed 36 people (1 on the ground, the rest on the airship) when it caught fire and exploded on landing. The explosion is believed to have occurred when a spark from a thunderstorm ignited leaking hydrogen, caused by a broken tensioning wire that punctured gas cell or a sticking gas valve.

Sometimes evidence is relatively easy to gather - many pieces of equipment now feed into automatic data collectors, which can provide reams of data about what happened for a specific period of time. Sometimes, however, evidence is much harder to come by. This is especially the case with fires or explosions which frequently destroy much of the available evidence.

When evidence is hard to come by, it is difficult to determine the exact cause-and-effect relationships that led to an incident. The best we may be able to do is capture different possibilities in a Cause Map, or visual root cause analysis, and leave the causes that haven't been validated by evidence as possible causes, indicated by a question mark.

Sometimes, determining the exact cause(s) is important enough to result in painstaking efforts like those performed by a team at the South West Research Institute. The team created three 1/10-scale models, not a small undertaking when the scale models are over 80 feet in length and is inflated with 200 cubic meters of hydrogen. They then replicated scenarios described by the various theories by setting fire to, and blowing up, the models. Additionally, they studied archive footage and eyewitness accounts to increase their

As a result, the team now believes they have determined what happened. Says Jem Stansfield, an aeronautical engineer and the project lead, "I think the most likely mechanism for providing the spark is electrostatic." The spark ignited leaking hydrogen, caused by a broken tensioning wire that punctured a gas cell or a sticking gas valve.



**More Detailed Cause Map** - Add detail as information becomes available.