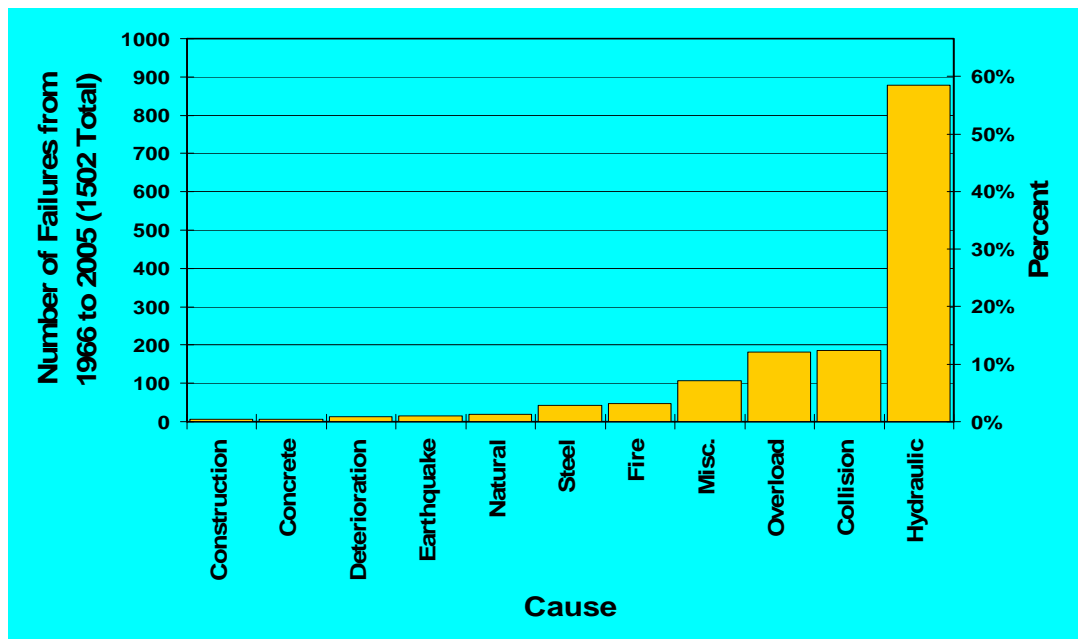


## CAUSES OF BRIDGE FAILURES

Jean-Louis Briaud, PhD, P.E.

It is not possible to design a bridge that will have zero risk of failure. This is due to the fact that the engineer designs the bridge for reasonable conditions but not for extraordinary conditions and that any calculation is associated with some uncertainty. There is simply not enough money on the planet to have such a zero risk bridge. So what are the main causes of bridge failure? The diagram below shows that hydraulic conditions, mainly erosion of soil around the bridge supports during big floods, accounts for 60% of the failures. Ship collisions are a distant second at 12% and earthquake is far down the list at 2%.



There are about 600,000 bridges in the country with 500,000 of them over water. This infrastructure represents an investment of some \$300 billion if it had to be totally replaced today. So the average cost of a bridge is \$0.5 million. The country's budget per year is \$2500 billion. Each year 2.5 million people die of various causes: 600,000 die of cancer, 600,000 die of heart attacks, 50,000 die in car accidents, a few hundred in airplane accidents in a bad year, and a few dozens at most die in a bridge collapse. According to these numbers, crossing a bridge is very safe compared to many of our daily activities.