Inviting Disaster: Lessons From the Edge of Technology

James R. Chiles

Inviting Disaster: Lessons From the Edge of Technology

James R. Chiles

Inviting Disaster: Lessons From the Edge of Technology James R. Chiles
Combining captivating storytelling with eye-opening findings, *Inviting Disaster* delves inside some of history's worst catastrophes in order to show how increasingly "smart" systems leave us wide open to human tragedy.Weaving a dramatic narrative that explains how breakdowns in these systems result in such disasters as the chain reaction crash of the Air France Concorde to the meltdown at the Chernobyl Nuclear Power Station, Chiles vividly demonstrates how the battle between man and machine may be escalating beyond manageable limits -- and why we all have a stake in its outcome.

Included in this edition is a special introduction providing a behind-the-scenes look at the World Trade Center catastrophe. Combining firsthand accounts of employees' escapes with an in-depth look at the structural reasons behind the towers' collapse, Chiles addresses the question, Were the towers "two tall heroes" or structures with a fatal flaw?

Inviting Disaster: Lessons From the Edge of Technology Details

Date	:	Published August 20th 2002 by HarperBusiness (first published 2001)
ISBN	:	9780066620824
Author	:	James R. Chiles
Format	:	Paperback 368 pages
Genre	:	Nonfiction, Science, Engineering, History, Technology

From Reader Review Inviting Disaster: Lessons From the Edge of Technology for online ebook

Nathalie says

Very interesting book. It shows how a combination of small things can lead to a catastrophe and the importance of a safety culture within an organization. However, the book was published in 2001; the introduction talks about 9/11 but, obviously, recent catastrophes are not covered.

Will Byrnes says

Chiles offers a history of many disasters, accidents, misfortunes, and contends that the increasing complexity of machines in the modern age has raised the likelihood of disasters happening. He provides blow-by-blow descriptions of how the many disasters happened, exactly what went wrong. He notes that much misery might have been avoided by a true focus on safety uber alles, but notes that in most instances other factors were at play. Pushing to meet deadlines results in cutting corners, forcing workers to work when they are over tired, simple human screw-ups. What might have been unpleasant a hundred years ago now has the potential for mass misery. When masters of machines, for instance, were housed in the same space there developed a sense on the part of the engineers of what sounds, for example, might indicate, showing problems that gauges were not telling. Today, remote controllers who are physically removed from their charges do not have the opportunity to exercise that hands-on touch-and-feel. It bears mentioning that Chiles does not paint a completely black picture. He cites instances in which corporations actually did the right thing, at great cost. He also notes that there are some that have established mechanisms for rewarding employees who speak up.

I found that while the details of the events noted here were interesting, I had a hard time focusing. It became a bit too dry a recitation of facts. I suppose the book has value as a warning to be ever-vigilant, but did not move me much.

Todd N says

This excellent book was recommended in the appendix of a book on project management that I am reading, Making Things Happen.

This book recounts disasters and near misses from what the author calls "the machine frontier," that scary space where machines deviate from their intended function, either through malfunction or bad design. The Kindle version starts with a preface that describes step by step how the World Trade Center towers collapsed on 9/11. Then the book starts with a detailed description of the sinking of an offshore drilling platform, the Challenger disaster, and the near meltdown at Three Mile Island reactor 2. There is a handy list of disasters covered in an appendix, which also includes Apollo 1, Apollo 13, dams bursting, bridges collapsing, cargo doors blowing off of DC10s, the Concorde crashing, and the R-101 airship falling out of the sky.

Each disaster is viewed in minute detail to show exactly how a (usually minor) malfunction or design flaw cascades through a complex system aided by further mechanical malfunctions or human misjudgment until

terrible forces are unleashed, usually resulting in a lot of dead people.

It is very interesting the way some disasters are juxtaposed against each other to show that there is nothing unique about them. People make the same mistakes over and over. For example, the stories of the fatal launches of the British airship R-101 (1930) and the Challenger space shuttle (1986) are told simultaneously in a way that makes it clear nothing was learned over the intervening 56 years. The same issues -- pressure to launch, ignoring technical advice, strongly worded but ultimately useless warnings, a culture of isolating and ignoring risks -- are present in both.

This book can be read on several levels. At the most basic level is the interesting level of reading about things that go boom. It's a little like slowing down to gawk at an accident, and there is enough detail provided to get a good, long look. On another level this book is full of lessons about leadership and project management. These lessons aren't explicitly stated until the end of the book (which tends to drag on just a little compared to the first part) but it's clear that each of these disasters was completely unavoidable in hindsight.

There are even lessons in this book for anyone involved in software development, even though when software fails the results aren't quite as spectacular. Highly recommended.

Eric_W says

Accidents and disasters are often caused by simple, random events or the change in a normal sequence of actions, any one of which could affect the outcome. Had the path of the Air France Concorde been slightly different, or the piece of titanium not fallen off a DC-10, or the plane left a tad earlier or later, or a sealant been used in the fuel tanks, or any one of any other seemingly unimportant events taken place, the plane's tire would not have struck the titanium and a piece of tire would not have opened a substantial leak in the plane's fuel tank, and the passengers and crew would still be alive today.

Another related book worth reading is Normal Accidents by Charles Perrow. Perrow had studied several major accidents and concluded that some forms of technology are more open to chains of failure and that adding more safety systems can actually lead to an increased likelihood of an accident because of the increase in complexity. The systems become so "tightly coupled" that a failure in any part of the system almost inevitably leads to a chain of unmanageable and uncontrollable events.

Chiles goes Perrow one further and makes recommendations as to how training and people can prevent the accidents by breaking one of the links in the chain. It requires that individuals throughout the organization be empowered to call decisions into question or to halt actions they believe to be of concern. He observed several industries as air traffic control centers, and aircraft carriers, (not to mention helicopter repair of high-tension lines!) which have impressive safety records despite a high level of coupling and danger.

It's a fascinating book that examines why disasters happened and what lessons can be gleaned from those tragedies. For example, the explosion of the steamboat Sultana killed hundreds at a time (1865) when Americans were seemingly inured to disasters of all kinds ("between 1816 and 1848, 233 explosions on American steamboats had killed more than two thousand people"). Steamboats were constantly being destroyed by boiler explosions, and, despite industry objections, the federal government had issued all sorts of controls and inspections. In the case of the Sultana, the captain was in a hurry, he wanted to pack as many prisoners (released from Andersonville prison) on board as possible (being paid [$:] per soldier and [$:] per

officer). The ship was way overloaded, which contributed to the boiler explosion because when the ship turned, its topheaviness caused the water level in the boiler to shift beyond safe levels. In addition, rather than have a crack in one boiler properly fixed, the captain had insisted on a patch that normally would have been fine, except that it was slightly thinner than the boilerplate on the rest of the boiler. That would have been OK, except that no one thought to change the setting on the emergency blowout valve to reflect the thinner metal of the repair, so a sequence of decisions that individually would have been unimportant resulted in a sequence that killed far more, on a percentage basis, than the 9/11 attacks.

It is possible to conduct accident-free operations, but Chiles says that it means changing normal operational culture and mindset. For example, challenging authority becomes crucial in preventing aircraft crashes and other jobs where people have to work as a team. The airlines have recognized this and no longer is there a pilot in command; the term now is pilot flying the plane with each pilot required to question the judgment of the other pilot if he/she thinks the pilot flying has made an unsafe move or decision.

I learned about the extraordinary safety record of companies that use helicopters to make repairs on high-tension electrical lines while the current is still on. That would certainly loosen my sphincter. The pilot hovers the craft within feet of the conductive lines while the electrician leans out on a platform, hooks a device to the line that makes the craft and everyone on it conduct up to 200,000 volts (they have to even wear conductive clothing), and makes repairs to the line. They have never had an accident in twenty-five years of doing this. Safety is paramount, they anticipate the unexpected, and everyone is an equal partner in the team and expected to point out conditions that might be unsafe. "A good system, and operators with good `crew resource management' skills, can tolerate mistakes and malfunctions amazingly well. Some call it luck, but it's really a matter a resilience and redundancy." Failing to have this resiliency can have tragic consequences. On December 29, 1972 an L-1011 crashed on approach to Miami because a light bulb indicating whether the landing gear was down had burned out and the entire four-man crew became involved in changing the bulb. They did not notice that someone had bumped the throttle lever releasing the autopilot that was supposed to keep them at two thousand feet, and the air traffic controller who noticed the deviation in altitude did not yell at them to pull up, not wanting to annoy the crew, but simply asked if everything was coming along. The plane crashed killing everyone on board.

Another key element is that people must be clear in speaking and writing, "even if doing so necessitates asking people to repeat what you told them. . . We know that people will try to avoid making trouble, particularly any trouble visible to outsiders, even though they are convinced that catastrophe is near." Chiles sites numerous instances where committed individuals went outside normal channels to get additional perspectives or assistance and prevented catastrophe. Those individuals always knew the leadership would back up their independent decisions even if they were wrong.

I have just scratched the surface. This book should be recommended reading for everyone.

Zaphoddent says

Good read for anyone involved with anything more complex than a basic calculator. Sometimes, the author does seem to go on down unnecessary tangents but overall this raised my awareness of the dangers of complacency, not just in chemical plants where I work, but on the road and in planes. I drove safer the week I read this and was more aware of airplane safety. I loved his suggestion of counting the steps between your seat and the nearest exit whenever you get on the plane, as in an emergency, everyone gets disorientated.

It's good to have reminders like this book showing how quickly things can go wrong and how much can be done to avoid disasters by speaking up. There are always warnings and most disasters start from small

deviations which are typically ignored.

The airplane stories were the most chilling as he gives multiple examples of situations in which if someone had spoken up, disaster could have been avoided. We're conditioned as passengers to keep quiet and pass the buck assuming that the person in authority must be aware of whatever strange sound or observation we've made. In every plane crash in this book, that assumption was terribly wrong! Not speaking up in an attempt to not look silly or whiny is a guarantee for disaster.

Gayle says

A hair away from 5 stars - the material is well researched and very interesting, but the writing suffers from an occasional lack of organization. Industrial disasters are often namedropped with little introduction, to add support to case studies that didn't need the assistance, then never mentioned again in that chapter. One otherwise solid chapter compares the similar histories and fates of the doomed Challenger launch and the R.101 dirigible 50 years before, but switches between the two with no meaningful transition, sometimes even from paragraph to paragraph. I read this on my Kindle so it is entirely possible that the print edition has some manner of visually distinguishing the two, but I found this chapter to be a jarring example of an ongoing issue throughout the book.

Also, don't read it on an airplane.

Dee Eisel says

This is another really interesting book on things we don't like to think about. In this case, it's engineering disasters instead of big weather or earth science - and trust me, if you like Modern Marvels or Seconds From Disaster, you will enjoy this book.

Unlike Megadisasters, Chiles takes the engineering instead of the statistical view of horrible things that happen to modern humans. He argues that there is a system to every disaster, and that certain things happen in common more often than not. The goal is to recognize these patterns and use them to prevent future issues.

Some of these disasters were completely unknown to me - I'd heard of Piper Alpha, for instance, but Chiles instead talks about the Ocean Ranger. I had seen this explosion at a Nevada rocket fuel plant (which, holy freaking cow! Watch that!), but I had never heard of the explosions of fertilizer on board ships which completely obliterated part of a port, and why they happened. Of course I had heard of Three Mile Island, but no one was talking about it by the time I got old enough to ask about what it was. Chernobyl was the power plant disaster of choice. Chiles discusses TMI and makes the point that we'll likely never know what happened because of the case being so tied up in the court system.

Boiler explosions? They happen. Nitroglycerine? It's here. Air crashes? Covered. And Chiles wants to make sure that we understand the way that our own brains contribute to the problems, as they all too frequently do. The fact is that any human-designed system is going to have human-introduced weaknesses, and sometimes we learn the hard way what those are. We can, and do, learn - the chapter on nitroglycerine is incredibly illuminating - but the cost can be high, and is often made higher by our own limitations.

When my fiance was working in air traffic, he talked about the "swiss cheese" method of disaster avoidence - the idea that there will always be holes in a system, but you want to keep them from lining up. This is a book

about instances where the hole went straight though the block of cheese, and how we can keep it from happening again.

Five of five stars.

Bill says

This type of book is my catnip so I wasn't surprised that I really enjoyed it. I appreciated that it covered some lesser-known incidents and near-misses that I hadn't heard of before. One lesson I took away from this book is to never ride a new submarine on its sea trials, especially in the project is under pressure for being late. You'll end up at the bottom of the sea, basically guaranteed.

Philip Hollenback says

Disaster porn at it's finest. This book is certainly not an in depth treatment of the subject, but it does provide an interesting perspectives on the commonalities inherent in the failure of complex machinery.

Janis Orlovs says

Excellent book, every IT must read.

all others should.

David says

You might not want to do what I did and read this on an airline flight. A collection of technological disaster scenarios, Chiles digs down to explore how bad design, unintended consequences, and technology and people set at cross-purposes resulted in disaster. I've read a few technical journal articles on incidents mentioned in the book, and while it's clear it is adapted from a TV series, I wish there was a bit more depth - some of the incidents are described very summarily. That being said, it's well worth it. As long as you're not in mid-air.

Ushan says

On April 27, 1865, as the Civil War was winding down, the steamboat Sultana was carrying released Union POWs up the Mississippi River. Just north of Memphis, its boilers exploded, killing some people with shrapnel or boiling water, staring fires that burned or suffocated others, and causing others to jump into cold water where they drowned. According to different estimates, 1100-1700 people died, making it the worst maritime disaster in US history. Why did it explode? The boat was grossly overcrowded: even though its legal passenger capacity was 376, it was carrying approximately 2300 POWs, making the boat top-heavy and causing it list during turns beyond the angle it was designed to. A few days before, one of the boilers had

developed a crack; the captain decided that repairing it properly would take too long, so he had a patch riveted to the boiler. The patch was thinner than regular boiler skin, but the emergency steam release valve wasn't adjusted accordingly. When the first boiler exploded, the shrapnel hit the others, and two of the other three boilers exploded, too; there were no bulkheads between them preventing this. The disaster did not have just have one cause; it had a cascade of multiple causes, and no measures taken to prevent such a cascade.

This book is a catalog of technological disasters: the explosion of space shuttle Challenger, the explosion of Air France Concorde, the Bhopal disaster, and more. Systems that are vastly more complicated than a 19th-century steamboat fail just as spectacularly. Chiles's solution for the future is: keep in mind that a disaster can happen; put in features that prevent it from cascading into a greater disaster so that, for example, an explosion at a chemical plant does not send debris flying around and causing more explosions; give the people who might see the telltale signs of the coming disaster the authority to prevent it.

Bill says

Well-written with good anecdotes, details, and insights about lots of disasters and near misses. Has its share of horrifying episodes, of course. Don't read it on a flight. Or a train. Or a boat. Good takeaways for system design, though.

Bob Mayer says

The author does a good job mixing older disasters with newer ones. He covers a lot of ground and a lot of disasters. The insights are powerful as are the stories told around each disaster. The focus is often the integration of man and machine, and the flaws inherent.

I found this book after watching Seconds From Disaster on the National Geographic channel due to my own interest in preventing catastrophe. When I was in the Special Forces (the Green Berets) a key component of our planning was anticipating all the possible ways things could go wrong and planning as best we could to avoid that catastrophe, and preparing as well as possible to survive it if it did occur.

This led me to start a new series of books: It Doesn't Just Happen: The Gift of Failure. While the author of this book does great detail on a wide spectrum of catastrophes, I focus on only 7 in each book, applying the Rule of Seven. Looking at the six cascade events leading up to the final catastrophe. As this author notes, there is always an element of human error in every catastrophe. Thus, every catastrophe can be avoided if we find that cascade event (often more than one) involving human error and eliminate it. I go beyond engineering disasters though to such events as the Donner Party and social disintegration leading to disaster. It's an interesting area everyone should learn about, whether thought this book or a show such as Second From Disaster. Because we all are a lot closer to such an event than we think.

Mike says

This book is part of a sequence that started with the book, "Build your Own Spaceship". The link, not tenuous, but not the major theme of this book, is the Apollo 1 spacecraft fire in 1967 (killed 3 astronauts: "Gus" Grissom, Ed White, and Roger Chafee). These men died on the ground in the Apollo capsule that was still being developed. Had this not happened (and no further similar accidents), it is possible that Man would

have trod on the Moon before 1969 (or earlier that year).

There is also a section on Apollo 13 (almost obligatory in any book dealing with NASA or technological machine disasters.)

The bulk of the book is a series (often intertwined) of disasters and near-misses (and interventions) that have happened throughout the industrial era. Mostly, of course, in the near past (last 100 years), but with some examples stretching back into the 19th century.

The author uses these examples to highlight, chapter-by-chapter, how the effects of complexity, "invisible" states/effects, and human ability contribute or cause major disasters. There are also examples of how these tendencies and short-comings can be (or at least seem to have been) overcome.

It's a very interesting take on things. Some of the examples are very well known, others less so, but all are interesting. It may not actually teach anyone who will go out an design something a lesson , but it makes you wish the book itself was longer (or newer - several recent disasters are not included, as it was written before 2000.)

It's a good, well conceived and executed book. Little tidbits out of the author's life help bring the book closer to home, as well. You should get a copy and read it.
