



The Challenger Launch Decision: Risky Technology, Culture, and Deviance at NASA

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When the Space Shuttle Challenger exploded on January 28, 1986, millions of Americans became bound together in a single, historic moment. Many still vividly remember exactly where they were and what they were doing when they heard about the tragedy. In *The Challenger Launch Decision*, Diane Vaughan recreates the steps leading up to that fateful decision, contradicting conventional interpretations to prove that what occurred at NASA was not skulduggery or misconduct but a disastrous mistake.

Journalists and investigators have historically cited production problems and managerial wrong-doing as the reasons behind the disaster. The Presidential Commission uncovered a flawed decision-making process at the space agency as well, citing a well-documented history of problems with the O-ring and a dramatic last-minute protest by engineers over the Solid Rocket Boosters as evidence of managerial neglect.

Why did NASA managers, who not only had all the information prior to the launch but also were warned against it, decide to proceed? In retelling how the decision unfolded through the eyes of the managers and the engineers, Vaughan uncovers an incremental descent into poor judgment, supported by a culture of high-risk technology. She reveals how and why NASA insiders, when repeatedly faced with evidence that something was wrong, normalized the deviance so that it became acceptable to them.

No safety rules were broken. No single individual was at fault. Instead, the cause of the disaster is a story not of evil but of the banality of organizational life. This powerful work explains why the Challenger tragedy must be reexamined and offers an unexpected warning about the hidden hazards of living in this technological age.

The Challenger Launch Decision: Risky Technology, Culture, and Deviance at NASA Details

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Bailey Hull says

Diane Vaughan wrote a meticulously detailed account about the tragedy of the Challenger launch. She researches the technological failings, but also dives deeper into the organizational culture of deviance, filled with political and bureaucratic influences. The combination of technology, political goals and instability, and bringing competitive business into the mission threatened the entire success of the mission. This book is dense and difficult to read at times, but if you're looking for a FULL account of why the Challenger launch failed, this is a book for you.

David Barnhill says

Dense but thorough

As a safety representative in a large organization with codified methods for submitting safety concerns this has been essential reading to my continued education. This mishap was not about the O-ring. It was about the paradigm in which evaluations of the O-ring were made. A structured, seemingly thorough way of determining safety concerns which showed its problems in one large explosion.

Jithu Gopal says

Diane Vaughan's work about what happens in hierarchy-heavy organizations that deal with 'unruly' technology, is well-researched and insightful, albeit a bit thick. The phrase 'normalization of deviance' draws multiple parallels in my line of work (which is a far cry from rocket science), which just shows the principle is sound and something to keep a cautious eye for. Not to mention, how the work-group functions with looming delivery pressure, constructing and normalizing risk, and most important of all, confirming to rules can be disastrous even though they are backed by well-intentioned brilliant minds.

Katie Pesznecker says

A meticulously researched examination of the Challenger disaster -- not only of its technological failings, but of the organizational culture, political influences, and threatening imbalance of new technology, ambitious goals, driving competition and scarce resources, as examined by sociologist Diane Vaughan. This book is "absolutely essential for organizations that design, manufacture, produce, and use high-risk technological products."

Here are some of my favorite quotes:

"The difficulties began not in 1986, but in 1972 when NASA received political endorsement of the Shuttle Program and its mission without the political commitment necessary to provide resources adequate to meet

program goals."

"As is so often the case when we begin to learn the complexities of a situation, some of the issues that had seemed very clear at the outset had become more confused. Only much later would I fully understand the extent to which oversimplification obfuscates and complexity brings understanding."

"The attention paid to managers and rule violations after the disaster deflected attention from the compelling fact that, in the years preceding the Challenger launch, engineers and managers together developed a definition of the situation that allowed them to carry on as if nothing was wrong when they continually faced evidence that something was wrong. This is the problem of the normalization of deviance."

"A culture is a set of solutions produced by a group of people to meet specific problems posed by the situations that they face in common."

"Amorally calculating managers intentionally violating rules to achieve organization goals does not explain the Challenger disaster. Managers were, in fact, quite moral and rule abiding as they calculated risk. Production pressures exerted a powerful influence on decision making, but not in the way many posttragedy accounts led us to believe. Originating in the environment of competition and the space agency's struggle for survival, production pressures became institutionalized. They permeated the organization, operating forcefully but insidiously in a prerational manner, influencing decision making by managers and engineers without requiring any conscious calculus."

"We ... probably never will have all the information about the Challenger disaster. Yet it is important to record and analyze this event because of its historic significance and for whatever lessons can be learned about organizational failures. While such understanding is relevant for all organizations, it is absolutely essential for organizations that design, manufacture, produce, and use high-risk technological products."

"There was lack of unanimity on the seriousness of the situation and whether it required something be done."

"Two decisions made by NASA in the early development period of the Shuttle Program became controversial after the loss of the Challenger: NASA's failure to redesign after the Ray memorandum stated that for there to be "no change" in the design was "unacceptable" and NASA's certification of the SRB design as flightworthy despite violating three industry standards."

"In glaring contrast to this public image, the engineers and technicians conducting risk assessments prior to each launch grappled with an uncertain technology that continuously produced anomalies—evidence that the shuttle was developmental, not operational."

"This was a meeting where the determination was to launch, and it was up to us to prove beyond a shadow of a doubt that it was not safe to do so. This is in total reverse to what the position usually is in a preflight conversation or a Flight Readiness Review. It is usually exactly opposite that."

"Thiokol engineers thought the cold would reduce resiliency, which in turn would affect redundancy. They had data on redundancy; they had data on resiliency. But they had no data on how resiliency affected redundancy."

"....under conditions of stress, communication—even among equals—tends to turn hierarchical."

"It can truly be said that the Challenger launch decision was a rule-based decision. But the cultural understandings, rules, procedures, and norms that always had worked in the past did not work this time. It was not amorally calculating managers violating rules that were responsible for the tragedy. It was conformity."

Excerpts From: Vaughan, Diane. "The Challenger Launch Decision."

Sarah says

First, I have to commend Vaughan for a stunningly researched and wonderfully structured book. It's extremely academic and linear - two qualities that happen to work for me, especially when tackling a subject as complex as The Challenger.

I found her sociological argument to be compelling and well made, though not always sufficient. Several times it seemed to me that she minimized individual mistakes to make her grander point about organizational culture. She also undervalued the warning memos written by engineers about the O-rings, which were very clearly written and appropriately worrisome. And, she actually hid in the appendix the crucial fact that blow-by increased after they were forced to use a new putty!

I think her points about the culture at NASA mostly hit the mark. But I do not think you can blame the culture entirely. There were individuals who were making the decisions to "normalize deviance," to use her terminology. There were individuals who ignored the pleading of experienced engineers who had intimate knowledge of the SRBs and previous experiences with blow-by. At what point were these managers rationally expected to break out of their cultural stereotypes and make a responsible decision? Because there had to be such a point. I think it was reached during the teleconference, but Vaughan seems to be giving them the benefit of the doubt. (And, really, who am I to say otherwise? Having the benefit of hindsight and having been influenced by reading too much Feynman, I was probably biased going into this...)

Still, this is quite a book. I can't stop pondering the appropriate use of engineering intuition, or feeling, without hard data backing up the intuition to make important, game-changing decisions. And how does one successfully navigate its use in a hardcore science context? It's a fascinating question.

Jim Duncan says

Extensively researched and referenced. Provides remarkable insights into the decisions and how clearly observed deviations from predictions were interpreted. The predictions were initially built around the design considerations for the solid rocket boosters but were later constructed from operational experience. Great insights into the engineering mindset - deviations are expected (no design is perfect) and once they are observed, they are treated as problems that need to be solved. At the same time, engineers have a mindset that "change is bad" - better the devil you know versus the devil you don't or Rumsfeld's "unknown unknowns".

Anyone involved in event investigations should read this book. Highlights the need for any accident reviewer to put themselves in the same context as those involved in the accident - think about how they got to each station along the way and why it made sense to continue as they did despite the weak signals (that become clear in retrospect) of the problems in the system.

Mark McGranaghan says

A sociologist examines the events leading to Challenger's tragic flight in 1986, on which seven astronauts died.

The author argues that neither specific managerial wrongdoing nor technical incompetence caused the disaster. Instead the failure originated systemically from NASA's engineering culture, which "created a way of seeing [technical problems] that was simultaneously a way of not seeing". These systemic factors were not particular to individuals within NASA or even NASA itself; the "routine and taken-for-granted aspects of organizational life" that shaped NASA's disaster are relevant for many organizations today.

To develop this thesis, the author deeply examines the cultural and organizational dynamics around NASA and the Space Shuttle program. We learn how NASA made day-to-day technical and managerial decisions that ultimately led to the failed launch, and how culture, power, organizational constructs shaped those decisions.

This study of human systems at NASA is in my mind the most interesting contribution of the book.

Recommended for those interested in the US space program, engineering/operations management, or the sociology of large engineering organizations.

Mike says

This book, while not light reading, is an important work. It is one of the best investigations into the Challenger disaster out there and will be appreciated by those interested in that story from history. This book, however, is not just a history book. It explores how bureaucracies work and why they often fail. It reminds the reader that a bureaucracy's failure is not necessarily the failure of one man in particular, or a result of gross incompetence at any step in the decision making process... that, often, these failures are rooted in the systems and cultures within which people work. That message can be eye opening, and is applicable to better understanding the workings of other government bureaucracies, and even, perhaps, our own private employers. This is one of those rare books that can change the way you look at the world around you.

Sam Weaver says

Seven lives lost in a space-shuttle explosion is a national tragedy, yet seven million lives lost every year due to tobacco use is merely a troubling statistic (WHO Report on the Global Tobacco Epidemic, 2013). Neither the ill-fated Challenger launch nor the ongoing campaigns of deception that allowed smoking, asbestos, and lead paint to escalate into public health catastrophes occurred because of isolated incidents—a sequence of bad decisions leads to every disaster. Although similar social pressures likely shaped working life at NASA as well as corporate boardrooms, the space agency's mistakes somehow inspire more emotional outrage, yet less moral revulsion than the actions of big industry.

Both the Challenger disaster and corporate criminality on the part of big tobacco or the asbestos industry stemmed from miscommunication of the risks associated with a technology. The difference arises from the assumed intrinsic motivations on the part of each institution: engineers at NASA made a mistake about the

resiliency and redundancy of booster rocket O-rings, whereas the tobacco and asbestos industries deliberately hid the fact that their products killed people. But upon closer inspection, similar forces contribute to bad decisions in a variety of organizations.

Normalization of deviance may be a necessary byproduct of big institutions, which foster environments where “people can see their own conduct as culturally approved and conforming, even when the behavior is objectively deviant.” (Vaughn, 1996, Ch 6). Vaughan’s deep ethnographic dive into NASA culture exonerates all individuals from culpability for the Challenger disaster, because “individual choice is constrained by institutional and organizational forces” (Vaughn, 1996, Ch. 2). Constraints on the social construction of risk also likely influenced the cigarette executives that ignored and misrepresented studies linking tobacco to cancer.

Institutional and organizational forces do not arise in a vacuum, however. Vaughan begins to assign blame by asserting that “elite actions eroded the strong research-oriented technical culture” (Vaughn, 1996, Ch. 6); though she never explicitly blames specific elites for the conditions at NASA. Punishing scapegoats can satisfy the public need for vengeance, but the prevailing discourse reflects a deeper understanding the complicated institutional dynamics at play. In the case of the Challenger launch, “we repeatedly read that “NASA” did this or “NASA” did that—language that simultaneously blames everyone and no one, obscuring who in the huge bureaucracy was actually doing what” (Vaughn, 1996, Ch. 2). Similarly, people condemn “big tobacco” or “the lead industry,” for misdeeds. Ironically, despite discovery documents from tobacco and asbestos litigation revealing extensive dishonesty by specific people, executives at those organizations largely got off scot-free.

People eventually forgave NASA after the 1986 Challenger explosion. Yet the initial shock left an indelible mark on the American consciousness, whereas ongoing revelations of corporate misdeeds merely inspire resigned frustration among the public. Although people generally aren’t eager to pardon big industry (with the possible exception of Rachel Maines’ bizarre and irresponsible revisionist history of asbestos), Americans seem to have normalized their expectations of deviance on the part of corporations. Vaughan’s prophetic warning at the end of *The Challenger Launch Decision* that such disasters will likely recur applies not only to the space agency, but organizations all over the planet.

Luke Marusiak says

Thick book that fascinates as we all think we know what happened the fateful day the Challenger exploded: managers requested a hold and they were overridden to hold the schedule. What Diane Vaughan, a sociologist, asks to great effect is why we believe committed professionals made a choice they knew could be a public catastrophe. The more you ask that question, the more you wonder what really happened?

This book answers that question with one phrase that resonates: normalization of deviance. In the culture of accepting high risks to begin with, there was an increased acceptance of data that normal people see as deviant. Eventually the cycle of normalization has the culture operating so far outside the rational that a catastrophe occurs.

A truly fascinating read of an insider look at the decisions that led to national tragedy; one of which we're all aware.

Brian Olinger says

I am a non academic and someone without a strong mathematical background. At the same time, I read quite a lot about neuroscience and some dense history. All that said, this book was incredibly hard work. While incredibly insightful content about group think and the fatal inability to differentiate between accuracy and precision, this book could use some pruning and a strong editor. Only a read for the interested academic or someone with a hearty appetite and good dictionary.

Nick says

It is difficult to overstate what an extraordinary volume this is. Vaughan, over nearly 600 pages, meticulously and systematically reexamines the political, cultural, and technical context of the signal technological failure of the space age.

This is not light reading—at times the author's desire for rigour crosses a line into rather tiresome repetition—but it is nonetheless well written. Technical concepts are clearly explained, and the seemingly endless complications of NASA process and culture are laid out in detail at appropriate moments. For most of the book, Vaughan replays in "ethnographic thick description" (her term) the working patterns and experiences of the Solid Rocket Booster teams at Morton Thiokol and NASA's Marshall Space Center. It is through these detailed descriptions that she explains the process, jargon, and cultural context apparently missed or misinterpreted by the Presidential Commission, and how these aspects contributed to the tragic 1986 launch decision.

The Space Shuttle project is one of the largest and most complex engineering projects ever undertaken, and this book convincingly dismantles a central tenet of Challenger folklore: that the disaster was simply explained and could have been easily avoided. Vaughan argues that this represents a gross misunderstanding of the reality. Namely, that the disaster's proximate cause (the failure of an SRB joint due to cold launch temperatures) can only be understood in a much broader and more complicated cultural context. The cultural prerequisites for the joint failure were harder to detect, and harder to address.

In all, a must read for anyone interested in the history of organisational dysfunction, the role of culture in technical organisations, or the complexity of technical systems failures.

Reiley says

I read this book for a book report for my Contemporary America class, and I enjoyed it. It was super informative, and includes probably absolutely everything there is to know about the Challenger disaster. I found a lot of information about the different branches and positions at NASA to help me with future careers that I am interested in, so I am very glad I read this book. I found out a lot about the mission that I didn't know before. Vaughan's writing style is interesting and she keeps the material from being dry for the most part. She tended to drag out certain aspects at some points, but it is a very technical part of history, so that was expected. I really appreciated the fact that she did not just focus on the technological aspects of the tragedy, and incorporated the psychological and sociological aspects of the launch decision making process. Overall, I am glad I read this book, especially considering that this is the event that got me interested in space exploration.

Marks54 says

This is a case study of the explosion of the Space Shuttle Challenger during liftoff in 1986. It is done by a capable sociologist who documents the details of the event and also embeds her explanation in a rich context of bureaucracy, technology, routines, and values - what many observers sum up as "culture". Her argument is detailed and nuanced but generally goes in the direction of arguing that cultural norms and routines in the situations, coupled with the exemplary safety record to date, lulled otherwise well meaning individuals into contributing to a very complex accident that took place in a situation so complex that nobody fully understood it. Such an explanation is fraught with implications for the modern age and takes on a rather gloom and doom prognosis with the implication that our dependence on technology and technologists can often lead to bad outcomes. In this sense, the book is similar to Charles Perrow's book "Normal Accidents" which covered the Three Mile Island accident that reshaped the nuclear power industry in America. In a similar vein, there are almost certainly comparable works in preparation regarding the Japanese earthquake, tsunami, and nuclear incident of early 2011.

While I think author gets a lot correct, there is often a sneaking suspicion that a rich case analysis is fairly impervious to criticism, since all the "facts" are there and the author gets to tell the entire complex story, with a command of facts that few readers can hope to match. The problem is not with the case study itself, but with the analysis and conclusions that stem from it. Even if one grants the entirety of the analysis, what a single albeit horrible case means for national policy is questionable -- and knowing a lot about certain circumstances does not really equip one to predict going forward. The next crisis, war, battle, etc. is always a bit different. So if you are going to invest in reading this, be prepared to draw your own conclusions. "Thick Description" -- which is what this type of analysis is -- is not a license to analyze whichever way one wishes. The facts seldom speak for themselves.

On a style note, the book is an academic study, so the syllable count is high as is the use of the passive tense. That is OK - it is still worth reading, although subsequent crises (9/11, the Icelandic volcano, or the Japanese earthquake) are more current in their interests. Besides, the last shuttle was just retired!

Erica says

Long but worthwhile research piece, and origin of the phrase "groupthink." It has been a while since I've read this, but I don't remember the prose as being stellar. Still, the sociology nerd is fascinated by the methodical way in which the author unpacks the process by which good people not only make bad decisions, but where good decisions are structurally prevented by the nature of the bureaucracy. Disagree with your boss!
