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MALICE OR SNAFU? PUNITIVE DAMAGES AND ORGANIZATIONAL CULTURE DEFECTS

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I. INTRODUCTION.

When can the conduct of a corporation be deemed sufficiently reprehensible to warrant the imposition of punitive damages? This is a much-debated question, but it has been complicated by developments in cognitive and social psychology over the last several decades, which show that wrongdoing by organizational actors is frequently the product of interactions among unconscious effects on individual decision-making and predictable departures from ideal group dynamics.[1]

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1. *See, e.g.*, YUVAL FELDMAN, THE LAW OF GOOD PEOPLE (2018); CASS R. SUNSTEIN & REID HASTIE, WISER: GETTING BEYOND GROUPTHINK TO MAKE GROUPS SMARTER (2015); MAX H. BAZERMAN & ANN E. TENBRUNSEL, BLIND SPOTS: WHY WE FAIL TO DO WHAT'S RIGHT AND WHAT TO DO ABOUT IT (2011); MAX H. BAZERMAN & DON MOORE, JUDGMENT IN MANAGERIAL DECISION MAKING (2009); ROBERT JACKALL, MORAL MAZES: THE WORLD OF CORPORATE MANAGERS (1988); IRVING JANIS, GROUPTHINK (2d ed. 1962); Jennifer K. Robbennolt & Jean R. Sternlight, *Behavioral Legal Ethics*, 45 ARIZ. ST. L. J. 1107 (2013); Jonathan Haidt et al., *The New Synthesis in Moral Psychology*, 316 SCI. 998 (2007); Linda K. Treviño et al., *Behavioral*

Explanation and justification are different things, of course, and predictable psychological effects do not excuse participation in wrongdoing.[2] Actors remain responsible even if their behavior may not be directly determined by their character or conscious intentions, but is also influenced by unconscious factors such as framing, bounded awareness, excessive optimism, confirmation bias, conflicts of interest, implicit bias, cognitive dissonance reduction, cascade effects, and groupthink. Even in a post-Kahneman and Tversky world we may say that an individual failed to use reasonable care or acted intentionally or recklessly, despite the findings of behavioral psychology.[3] Reasonable care, for example, may include taking steps to mitigate the effects of unconscious processes or badly designed decisionmaking structure where safety-related matters are at stake.

The question I will consider here is when organizational dysfunction crosses over into the kind of reprehensible behavior, approximating malice or intentional wrongdoing, that is the basis for punitive damages, both at common law and under the Supreme Court's due process jurisprudence. The paper will use as a case study the design and certification of the Boeing 737-MAX. (I'll try to relegate most of the aeronautical technicalities to the footnotes). Hundreds of people died in two 737-MAX crashes, Lion Air Flight 610, on October 29, 2018, and Ethiopian Airlines Flight 302, on March 10, 2019.[4] The similarity of the accident scenarios—in-flight loss of control on departure, caused by sudden and repeated nose-down movements of the horizontal stabilizer—led to the grounding of the 737-MAX fleet worldwide pending a determination of the cause. The answer—as engineers would say, the proximate cause—was the half-baked design of a system that applied rapid, aggressive, and repeated nose-down stabilizer trim inputs under certain very unusual flight conditions. The system had a single point of failure which was implicated in both accidents. Making

Ethics in Organizations: A Review, 32 J. Mgmt. 951 (2006); Ann E. Tenbrunsel & David M. Messick, *Ethical Fading: The Role of Self-Deception in Unethical Behavior*, 17 Soc. Just. Res. 223 (2004).

2. *See, e.g.*, John M. Doris, Lack of Character: Personality and Moral Behavior (2002) (rejecting the temptation to believe that "since we can understand the decisions taken by all participants, sympathize with their plight, and even realize that we might not have acted so differently, no ethical transgressions have been committed.").

3. For popular summaries of this literature, *see, e.g.*, Michael Lewis, The Undoing Project: A Friendship that Changed Our Minds (2016); Daniel Kahneman, Thinking, Fast and Slow (2011); Dan Ariely, Predictably Irrational: The Hidden Forces That Shape Our Decisions (2009).

4. W. Bradley Wendel, *Technological Solutions to Human Error and How They Can Kill You: Understanding the Boeing 737 Max Products Liability Litigation*, 84 J. Air L. & Com. 379, 381–82 (2019).

matters worse, Boeing had not fully described the operation of the system in the Flight Crew Operations Manual (FCOM) provided to customers (and ultimately to pilots), on the theory that any malfunction in the system would manifest as a relatively straightforward anomaly that pilots are trained to deal with. Notwithstanding the rationales for the design and information choices it made, I do not believe anyone seriously disputes that these were clear design and warnings defects which would subject Boeing to liability for compensatory damages under American products liability law, leaving aside complications related to international aviation accident law and choice of law principles.

If the 737-MAX design was the proximate cause, again in engineering terms, of the Lion Air and Ethiopian accidents, the root cause was arguably a culture that had taken root at Boeing, making failures such as the 737-MAX design more likely. Regarding the culture at Boeing, a certain narrative has become accepted as conventional wisdom, described in numerous journalistic accounts,[5] the report of a Congressional investigative committee,[6] the book *Flying Blind*,[7] and the documentary *Downfall*.[8] The story goes like this: Boeing enjoyed a well-deserved decades-long reputation as a solid, engineering-driven company in which safety concerns were always paramount. Then came the merger with McDonnell-Douglas in 1996 which led to the adoption of an organizational culture that prioritized maximizing stock prices and shareholder value, subordinated engineering values to cost-cutting concerns, and reoriented internal reporting relationships to place bean-counting MBAs in charge of teams of engineers.[9]

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5. *See, e.g.*, Natasha Frost, *The 1997 Merger That Paved the Way for the Boeing 737 Max Crisis*, QUARTZ, Jan. 3, 2020; Jerry Useem, *How Boeing Lost Its Bearings: The Long-Forgotten Flight That Sent Boeing Off Course*, ATLANTIC, Nov. 20, 2019; Maureen Tkacik, *Crash Course: How Boeing's Managerial Revolution Created the 737 Max Disaster*, NEW REPUBLIC, Sept. 18, 2019.

6. HOUSE OF REPRESENTATIVES, COMM. TRANSP. & INFRASTRUCTURE, THE DESIGN, DEVELOPMENT, AND CERTIFICATION OF THE BOEING 737 MAX 36–37. (2020) [hereinafter HOUSE TRANSP. COMM. REP.].

7. PETER ROBISON, FLYING BLIND: THE 737 MAX TRAGEDY AND THE FALL OF BOEING 58–74 (2021).

8. DOWNFALL: THE CASE AGAINST BOEING (Imagine Documentaries 2022) (available on Netflix).

9. The highly respected aerospace industry analyst Richard Aboulafia blames the influence of a different corporation, General Electric, where former Boeing CEO Jim McNerney and current CEO David Calhoun had been proteges of Jack Welch. Welch became a leading figure in American business circles for "single-minded emphasis on shareholder returns above long-term thinking and new product development, [and] the neglect of (and open contempt for) the people who actually develop and build the company's products." *See* Letter from Richard Aboulafia (June 16, 2022) (available at https://richardaboulafia.com/june-2022-letter).

Around the same time Boeing also relocated its headquarters to Chicago and much of its production (though not of the 737-MAX) to South Carolina in order to take advantage of anti-union laws there.[10] Wall Street was happy with Boeing management, sending the stock price, along with executive compensation, soaring. Then the company was confronted by a market shock when Airbus introduced a fuel-efficient variant on its popular A320 narrowbody jetliner, risking a further loss of market share to Boeing's European rival. Rather than develop a clean-sheet design to compete, Boeing hastily updated its venerable 737 airframe by adding new, more fuel-efficient, and larger engines. In order to attract customers who had an existing fleet of 737 aircraft, Boeing committed itself to a goal of a redesign that would not require extensive additional training for flight crews.

Then, when a relatively minor aerodynamic issue—one that would not arise during normal airline operations—was discovered during flight testing, Boeing adopted a software fix known as Maneuvering Characteristics Augmentation System (MCAS) for the purpose of certifying the design. However, it decided not to disclose the operation of the system to the FAA, or describe it in the Flight Crew Operation Manual for the aircraft, out of concern that the FAA would require simulator training for pilots transitioning from existing models of the 737 to the MAX.[11] The MCAS system proved to have significant design defects (as that concept is understood in American products liability law), and these defects were the proximate cause, now in tort law terms, of the Lion Air 610 and Ethiopian Airlines 302 accidents.[12] When details of the MAX design, including MCAS, came to light, the aircraft was grounded worldwide. Public confidence in the once-proud engineering firm plummeted; Boeing dropped sixty-five spots, from #19 to #84, in the 2020 Harris Poll of corporate reputation.[13]

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10. Boeing recently announced it was moving its headquarters again, this time to the Washington, D.C., metro area, presumably because much of its business is now with the Pentagon, as a defense contractor. *See* Stuart A. Thompson, *Boeing Plans to Relocate its Headquarters to Virginia from Chicago.*, N.Y. Times, May 5, 2022.

11. *See* United States v. Forkner, 584 F.Supp.3d 180, 184–85, 188–89, 192 (N.D. Tex., 2022) (granting in part and denying in part motion by former Boeing Chief Technical Pilot for the 737-MAX to dismiss indictment for making false statements to the FAA and committing wire fraud).

12. Although subsequent remedial measures are not admissible in court to prove a defective design, the design and instructional changes made to get the 737-MAX back into service show that these features were clearly feasible from the outset and should have been incorporated. Section II will consider the nature of the defect in the MCAS design in greater detail.

13. *The 2020 Axios Harris Poll 100 reputation rankings*, Axios (July 30, 2020), https://www.axios.com/2020/07/30/axios-harris-poll-corporate-reputations-2020. Boeing appears to have fallen off the top 100 in the 2021 poll, which is to say its reputation is lower than the Trump Organization, at #100.

There has been considerable scholarly and journalistic interest in the dysfunctional organizational cultures that led to debacles such as the launch and loss of the space shuttle *Challenger*,[14] the collapse of Enron,[15] the cheating by Volkswagen on emissions tests,[16] the fraudulent bank accounts opened for thousands of Wells Fargo customers,[17] the *Deepwater Horizon* explosion and oil spill in the Gulf of Mexico,[18] and the failure by General Motors to respond effectively to defects in the ignition switches in some of its cars.[19] The dynamics of organizational cultural failures are by now fairly well understood. One of the common themes is that the root cause of the failure is not "a few bad apples," as the saying goes, but something structural and pervasive within the organization. In some cases the failure is the result of top-down directives from senior leadership, sometimes driven by market pressures. The Volkswagen cheating scandal follows this pattern, as does the Enron debacle and probably Wells Fargo as well. Other situations, however, are more subtle, and sometimes are the result of the unintended consequences of either neutral or well-intentioned organizational decisions. There is a folklore version of the *Challenger* launch story, in which an engineer for Thiokol, one of the contracting firms, heroically tried to prevent the launch, but was shot down by managers at NASA and Thiokol, one of whom notoriously told the engineers to take off their engineering hat and put on their management hat. In reality, the story is quite a bit more complicated, involving subtle psychological factors at work at the level of both individual and collective decisionmaking. The same is probably true of the *Deepwater Horizon* accident as well. Finally, as detailed in the report of an internal investigation by Jenner and Block, the GM ignition switch response is almost entirely a story of dysfunctions in the company's organizational culture that were the result of well-intended procedures and reporting structures that had the unintended effect of diffusing responsibility so

14. DIANE VAUGHAN, THE CHALLENGER LAUNCH DECISION: RISKY TECHNOLOGY, CULTURE, AND DEVIANCE AT NASA (1996).

15. BETHANY MCLEAN & PETER ELKIND, THE SMARTEST GUYS IN THE ROOM: THE AMAZING RISE AND SCANDALOUS FALL OF ENRON (2003).

16. JACK EWING, FASTER, HIGHER, FARTHER: THE VOLKSWAGEN SCANDAL (2017).

17. Bethany McLean, *How Wells Fargo's Cutthroat Corporate Culture Allegedly Drove Bankers to Fraud*, VANITY FAIR, May 31, 2017; INDEP. DIRS. OF THE BD. OF WELLS FARGO & CO., SALES PRACTICES INVESTIGATION REPORT 77, 83, 95, 107 (2017).

18. EARL BOEBERT & JAMES M. BLOSSOM, DEEPWATER HORIZON: A SYSTEMS ANALYSIS OF THE MACONDO DISASTER (2016).

19. ANTON R. VALUKAS, for Jenner & Block, REPORT TO BOARD OF DIRECTORS OF GENERAL MOTORS COMPANY REGARDING IGNITION SWITCH RECALLS 2 (2014) [hereinafter VALUKAS REPORT]; Hilary Stout et al., *For a Decade, G.M. Response to a Fatal Flaw Was to Shrug*, N.Y. TIMES, June 5, 2014.

thoroughly within the organization that no one really had any ability to respond effectively.

In my judgment Boeing is an intermediate case between on the one hand the failure by GM to recognize and rectify the ignition switch problem, which I would characterize as a kind of SNAFU,[20] with emphasis on "situation normal," that is difficult to avoid in a large, decentralized organization, and on the other hand the conscious imposition by upper management of unrealistic goals that foreseeably would reorient lower-level managers and employees away from goals like safety and social responsibility. (The folklore version of the *Challenger* launch decision would be on this end of the spectrum of reprehensibility, but again, I do not believe it is an accurate account.) Even granting the truth of some of the most damning allegations, such as reports by flight-test crews that MCAS behaved in surprisingly aggressive ways and calls by some engineers to include information about MCAS in the FAA-approved Flight Crew Operation Manual for the plane, the ultimately fatal decisions did not arise from a state of mind that traded lives for dollars or ignored safety concerns. Rather, there were mistakes, bureaucratic inertia, pressures to conform, miscommunications, perhaps unwarranted optimism (e.g., that flight crews would handle an inadvertent MCAS operation as an ordinary trim runaway), failures to be more proactive in managing risks, and above all a kind of blinkered obsession with not having to retrain flight crews which may have led to unconscious framing of some of the judgments regarding MCAS. In order words, the explanation is more in line with the findings of behavioral psychology—including unconscious framing effects and predictable dysfunctions of group behavior—than with an assumption that Boeing was a rogue actor that was consciously indifferent to safety. If that is right, the question is what legal tools should be used in response to a company with an unhealthy organizational culture. In particular, is the big stick of a punitive damages award the best tool for improving safety, given what we know about the dynamics of corporate culture failures?

In doctrinal terms, the argument of this paper is that Boeing's conduct, in the conventional-wisdom story recounted above, does not rise to the level of malice, as required by the common law of punitive damages,[21] or the reprehensibility required by the constitutional test

20. A military term that has passed into common usage, meaning "situation normal—all f—-ed up."

21. *See, e.g.*, Owens-Ill., Inc. v. Zenobia, 601 A.2d 633, 655 (Md. 1992); Tuttle v. Raymond, 494 A.2d 1353, 1363 (Me. 1985).

from the Supreme Court's *Gore* and *Campbell* cases.[22] No one at Boeing had the requisite mindset of indifference to the safety of the flying public, even in the weak form of a "lives for dollars" mindset. In any event, the rhetoric of trading lives for dollars is too vague to do any real normative work. It must contend with legal and pragmatic limits, including the fiduciary duty managers have to shareholders to promote their welfare, [23] the principle recognized in products liability law that perfect safety is an unattainable goal, and the understanding of engineers that tradeoffs are inevitably involved in design decisions. Stubborn adherence to a design goal, the parameters of which were believed to provide reasonable safety, is not the type of quasi-malice that supports the award of punitive damages. This was not Ford Pinto 2.0 (although even the Ford Pinto story is more nuanced than is generally thought to be the case).[24] It is closer to the "normalization of deviance" story told by Diane Vaughan to explain the decision to go ahead and launch the *Challenger* in weather conditions that led to the failure of the O-rings on one of the solid-fuel rocket boosters, or the account of the dithering and bureaucratic dysfunctions within General Motors that led to a significant delay in that company's response to accidents caused by defects in the ignition switches on some GM cars. This type of culture failure can lead to accidents, or in the case of GM or Boeing, a series of accidents, but I do not believe it is best described with the punitive-damage epithets of reprehensible, malicious, wanton, and so on.

It is not sufficient to point out that organizations sometimes behave in predictably bad ways. If bad behavior is predictable, a legal standard of care might impose liability on managers for failing to take reasonable steps to mitigate behavioral effects that can be expected to interfere with good decisionmaking processes. Still, there is a gap between two descriptions of organizational cultures: (1) behaving predictably badly with bad outcomes, where reasonable care might have led to improved decisionmaking and better outcomes, and (2) knowingly, consciously, or willfully tolerating organizational dysfunctions, or intentionally doing things that are known to exacerbate organizational dysfunctions. While it is probably a close question, I see Boeing's behavior in connection with the 737-MAX design and

22. State Farm Mut. Auto. Ins. Co. v. Campbell, 538 U.S. 408, 419 (2003); BMW N. Am., Inc. v. Gore, 517 U.S. 559, 575 (1996).

23. Leo E. Strine, Jr., *The Dangers of Denial: The Need for a Clear-Eyed Understanding of the Power and Accountability Structure Established by the Delaware General Corporation Law*, 50 Wake Forest L. Rev. 761, 766, 771 (2015).

24. *See* Gary T. Schwartz, *The Myth of the Ford Pinto Case*, 43 Rutgers L. Rev. 1013, 1067 (1991).

certification process as falling within the former description. Thus, punitive damages are not justified on retributivist grounds in this case.

This conclusion also has implications going forward, not just in the analysis of Boeing's liability, if one believes that punitive damages play an important role in deterring corporate misconduct. If organizational culture dysfunctions are the root cause of some well-known disasters, such as the GM ignition switch failures, the *Challenger* launch decision, or the 737-MAX crashes, there is a risk that legal responses tailored to the misconduct of a few rogue employees—the classic "bad apples" explanation—will fail to address the underlying causes of many serious accidents. A further problem arising from the mismatch between the root cause of accidents and legal remedies is that the public understanding of the explanation of the 737-MAX or similar disaster may assume it has something to do with greed, callousness, or indifference to safety—i.e., something that can be described as involving a reprehensible attitude. If a regulatory response is tailored to a SNAFU explanation, it may seem to the public that something in afoot, powerful institutions are abetting a coverup, the game is rigged, and so on.[25] On the other hand, care is required with the SNAFU category, lest it swallow up cases in which something reprehensible actually was going on, and where punitive damages would be justified. The response to these concerns, however, is not to debate them in the abstract, but to dig into the facts and applicable law of the case. As often as not, the story is more complicated than it may appear from the conventional accounts of these disasters.

II. The Design and Certification of the 737-MAX.

As is well known, the analysis of design defects in products liability law can proceed using a risk-utility or consumer-expectations framework. The consumer-expectation test originated with Section 402A of the Second Restatement of Torts, surely one of the most consequential Restatement provisions ever adopted. A comment to Section 402A defined a design defect as one that renders a product "dangerous to an extent beyond that which would be contemplated by the ordinary consumer who purchases it, with the ordinary knowledge common to the community as to its characteristics."[26] The comment was drafted in contemplation of products like butter or whiskey, which have unavoidable dangers associated with their use. However, as the influence

25. Hat tip to Miriam Baer for making this point very powerfully in her comments at the Symposium.

26. Restatement (Second) of Torts § 402A, cmt. i (Am. L. Inst. 1965).

of Section 402A spread, courts were confronted with the problem of determining what the reasonable (ordinary) consumers expects about the performance and safety aspects of complex products. It was clear even in the early days of the "products liability revolution" that it would be unfair to hold manufacturers liable for all harms causally related to the design choices they made in light of tradeoffs between performance, cost, and safety. Consumers had the right to expect *reasonable* safety, but not perfect safety.[27] Outside of the context of manufacturing defects, where a particular copy of a product deviated from the manufacturer's specifications, it was not accurate to think of the liability of manufacturers as truly strict. This was understood long before the Third Restatement process got underway,[28] and a fairly clear consensus had emerged that the pure risk-utility approach should be confined to cases in which the everyday experience of regular people permitted an influence that the design violated minimum safety expectations.[29]

Section 2(b) of the Products Liability Restatement, part of the American Law Institute's (ALI) Third Restatement of Torts, defines a design defect in terms of a reasonable alternative design (RAD) that could have reduced or avoided the risk.[30] The risk-utility test and requirement of showing a RAD were highly controversial, both during the process of drafting the Third Restatement and following its adoption by the ALI, as state courts considered it.[31] In theory, jurisdictions not following the Third Restatement's approach can deem a product defective if it violates the reasonable expectations that consumers have regarding safety. A pure consumer-expectation test would not require proof of an alternative design that could have reduced or avoided the harm. As one of the Reporters of the Third Restatement has argued, however, courts in jurisdictions that purport to apply the consumer-expectation test do not generally allow a design-defect case to reach the jury absent substantial evidence introduced by the plaintiff of a RAD.[32] Even if only to make the theory of liability more

27. *See, e.g.*, Heaton v. Ford Motor Co., 435 P.2d 806, 808 (Or. 1967).

28. *See, e.g.*, Sheila L. Birnbaum, *Unmasking the Test for Design Defect: From Negligence [to Warranty] to Strict liability to Negligence*, 33 VAND. L. REV. 593, 613–14 (1980).

29. *See, e.g.*, Soule v. Gen. Motors Corp., 882 P.2d 298, 308 (Cal. 1994).

30. RESTATEMENT (THIRD) OF TORTS § 2(b) (AM. L. INST. 1998).

31. Aaron D. Twerski & James A. Henderson, Jr., *Manufacturers' Liability for Defective Product Designs: The Triumph of Risk-Utility*, 74 BROOK. L. REV. 1061, 1065, 1070–71 (2009); James A. Henderson, Jr. & Aaron D. Twerski, *Achieving Consensus on Defective Product Design*, 83 CORNELL L. REV. 867, 879–87 (1998); Marshall S. Shapo, *In Search of the Law of Products Liability: The ALI Restatement Project*, 48 VAND. L. REV. 631, 654, 661–63 (1995).

32. Aaron D. Twerski, *An Essay on the Quieting of Products Liability Law*, 105 CORNELL L. REV. 1211, 1229, 1231 (2020).

persuasive to a jury, a competent plaintiff's lawyer in a case of any significant complexity would almost certainly develop evidence that the manufacturer could have adopted a redesign, using technologically feasible means, that would have mitigated the risk without excessively interfering with the utility, including affordability, of the product.

There is no need to litigate the design-defect vs. consumer-expectation issue yet again in this context, however, because the 737-MAX design should be deemed defective under either formulation.[33] In hindsight it is almost incredible that it was adopted. However, a careful look at the design goals for the aircraft and the decisionmaking processes of Boeing managers and engineers helps explain why these design features were incorporated.

The defect in the MAX design has to do with an automated, software-driven system that was intended to run in the background and make inputs to the flight control system of the aircraft only under highly unusual conditions. The system, called Maneuvering Characteristics Augmentation System (MCAS), would introduce nose-down horizontal stabilizer trim if the angle of attack, as measured by a vane on the outside of the captain's side of the nose of the aircraft, exceeded a specified angle *and* the flaps were up *and* the crew was hand-flying the aircraft (that is, not using the autopilot).[34] A high-angle-of-

33. I wrote a paper relatively soon after the Lion Air 610 and Ethiopian Airlines 302 accidents, describing the aeronautical and product design aspects of those events, as best as I was able to at the time, given what was known from media accounts and preliminary findings of official investigations. *See* Wendel, *supra* note 4. Most of the technicalities in that paper are still sound and can be referred to for the aviation minutiae mentioned here. Based on subsequent reporting and official investigations published after my paper, I understand a few things slightly differently, however. The most important is the exclusive role of MCAS in meeting certification requirements, with no expectation that it have any role in normal operations, even as a kind of backup anti-stall system. An anti-stall system intended for operational use could be intended to prevent events like the Colgan Air #3407 crash where the flight crew failed to add power during a level-off on arrival, stalled, and then mucked up what should have been a straightforward recovery. *See generally* NAT'L TRANSP. SAFETY BD., AIRCRAFT ACCIDENT REPORT: LOSS OF CONTROL ON APPROACH, COLGAN AIR, INC. OPERATING AS CONTINENTAL CONNECTION FLIGHT 3407, BOMBARDIER DHC-8-400, N200WQ, CLARENCE CENTER, NEW YORK, FEB. 12, 2009 (2010). Much of the early reporting on the 737-MAX, even by experienced aviation journalists, understood MCAS as a safety feature aimed at preventing stalls, and I analyzed the risk-utility test for design defect with that assumption. If in fact, however, MCAS does not have expected utility in preventing Colgan #3407-type accidents but was incorporated only to meet certification requirements for dynamic stability in highly unusual flight conditions, the 737-MAX fares even worse on the risk-utility analysis.

34. *See* Dominic Gates & Mike Baker, *The Inside Story of MCAS: How Boeing's 737 MAX System Gained Power and Lost Safeguards*, SEATTLE TIMES, June 22, 2019. Angle of attack (AOA or alpha) refers to the angle between the mean chord line of the wing and the relative wind. *See* H.H. HURT, AERODYNAMICS FOR NAVAL AVIATORS 22 (1965); WOLFGANG LANGEWIESCHE, STICK AND RUDDER: AN EXPLANATION OF THE ART OF FLYING 18–24 (1944). Every wing has a critical AOA at which the drag produced by the wing so greatly exceeds lift

attack situation with flaps up and autopilot off could potentially be encountered during climb-out, but it would be extremely unlikely to occur during ordinary airline operations. In fact, MCAS was not really designed to intervene during normal flight conditions, or even in foreseeable abnormal circumstances. It is therefore not strictly accurate to refer to it as an "anti-stall" system, although this description is common in media reports. Rather, MCAS was added during the process of FAA certification when Boeing engineers realized that required control inputs by the flight crew (the so-called stick force curve, which is a measure of the aircraft's dynamic stability) would not vary in a linear way when airspeed was decreasing at a high angle of attack.[35] The situation in which the stick-force curve would become non-linear was encountered only in the course of flight-test maneuvers which would be vanishingly unlikely to be needed by a crew operating an aircraft in airline service.[36] It is worth emphasizing that the nose-down stabilizer

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that the aircraft can no longer maintain altitude. This is known as an aerodynamic stall (it has nothing to do with the engines running or not—pilots practice power-on stall recoveries regularly). Although the critical AOA is constant, the airspeed at which a stall will occur varies according to the weight of the aircraft, including weight that is put on the wing in a turn ("loading up" the wing). However, civilian pilots still use airspeed as a rough proxy for AOA, building in a sufficient margin over the stall. Stabilizer trim refers to the angle of the horizontal tail, the stabilizer, which has a movable panel on the aft side called the elevator. Pulling back or pushing forward on the control yoke causes the elevator to move up or down, which deflects the nose of the aircraft up or down. Change to the angle of the whole stabilizer is accomplished using manual trim wheels on the center pedestal (between the captain's and first officer's seats) or using thumb-operated electric switches on the control yoke. In the unlikely event that the electric trim motor gets a mind of its own, it can be cut out using switches on the center pedestal, leaving the manual wheels available to make trim changes. At a given power setting and configuration (*i.e.*, flap settings and landing gear up or down), a particular trim angle will yield a specific airspeed. Pilots of aircraft with conventional flight control designs fiddle with the elevator trim frequently during phases of flight, such as climb-out and approach, involving multiple configuration and power changes. Airbus pilots, on the other hand, are relieved of having to make trim changes by the aircraft's flight control system.

35. The FAA's certification standards for transport category aircraft specify as follows, under the heading of "stall characteristics":

> It must be possible to produce and to correct roll and yaw by unreversed use of the aileron and rudder controls, up to the time the airplane is stalled. No abnormal nose-up pitching may occur. The longitudinal control force must be positive up to and throughout the stall. In addition, it must be possible to promptly prevent stalling and to recover from a stall by normal use of the controls.

14 C.F.R. § 25.203(a) (emphasis added). Furthermore, the certification standards specify a stable stick-force curve throughout various regimes of flight. *See* 14 C.F.R. § 25.175(a). Stick force refers to the force pilots feel in the flight controls when they attempt to move the airplane from the flight path it is trimmed for.

36. *See* Gates & Baker, *supra* note 34 (noting the issue with non-linear stick forces was detected during a flight-test maneuver known as a wind-up turn). A wind-up turn flown at a constant altitude without any power changes would involve a steadily increasing bank angle, and hence increasing AOA since additional back pressure on the controls would be required to hold altitude constant, until the critical AOA is reached and the wing stalls (or, likely for flight-testing

trim inputs were required in those highly unusual cases only to meet certification requirements, not to make the plane safer in ordinary operations.

In engineering slang, MCAS was a kludge—a workaround, a hack, a quick and dirty solution to an inconvenient problem that avoided the necessity of a more comprehensive redesign. What set the chain of events leading to MCAS into motion was the installation on the 737-MAX of larger, more fuel-efficient LEAP engines, manufactured by CFM International. The new engines allowed Boeing to promise significant operating cost savings to purchasers of the 737-MAX. In fact, Boeing was feeling substantial competitive pressure from its perennial rival, Airbus, which had been first to market with a fuel-efficient single-aisle aircraft, the A320neo (for "new engine option"), which was proving popular with airlines. Rather than work on a completely new design to compete with the A320neo, Boeing decided to re-engine its existing 737NG (for "Next Generation") airframe, a proven design that was a workhorse in short- to medium-haul airline operations worldwide. Not only would it take much less time to get a 737 variant through the certification process and to market, but it might be possible to market the variant to existing 737 customers by promising a fast, inexpensive transition training process for pilots already trained and certified on the 737NG. But the new LEAP engines on the MAX created the pitch-up tendency discovered during flight testing, which was the root cause of all of the MCAS-related design and information defects.[37]

In the discussion of organizational decisionmaking to follow, the pivotal decision made by Boeing was to keep the design of the 737-MAX as close as possible to that of the 737NG. This was never a secret, either inside the company or for public consumption (this fact tends to undercut the imputation of a nefarious motive to Boeing engineers and managers). The company's goal was to be able to represent to airlines that current NG pilots would be able to transition to the MAX with only limited additional training.[38] The internal benchmark became Level B training:

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of swept-wing jets, when the stick shaker activates—no one wants to get into an actual stall in a transport-category jet). While it is far from an extreme maneuver by the standards of competition aerobatics, airshow performance, or aerial combat maneuvering, there is nothing in airline operations that remotely approximates a wind-up turn.

37. Gates & Baker, *supra* note 34.

38. *See* House Transp. Comm. Rep., *supra* note 6, at 19–20, 97–98; Robison, *supra* note 7, at 136–37. Media reports often talk about 737-MAX differences training being something that was possible to complete on an iPad.

> Level B training is applicable to related aircraft with system or procedure differences that can adequately be addressed through aided instruction. At level B, aided instruction is appropriate to ensure pilot understanding, emphasize issues, provide a standardized method of presenting material, or aid retention of material following training. Level B aided instruction can utilize slide/tape presentations, computer based- tutorial instruction, stand-up lectures, or video tapes.[39]

Importantly, Level B training could be integrated into a regular schedule of revenue flying. Boeing was trying its utmost to avoid incorporating design changes that would trigger Level D training, requiring a full-motion flight simulator (a device "capable of performing flight maneuvers in a dynamic real time environment"); this level of training would require pilots to come off the schedule of revenue flying to travel to the airline's simulator facility for several days of classroom and simulator sessions. Making physical changes to the airframe of the 737-MAX to alter its aerodynamic characteristics might have made the MAX handle differently enough from the NG that the FAA would mandate full-motion Level D flight simulator training to familiarize current NG pilots with the new aircraft.[40] For this reason, Boeing settled on a design that, in theory, would be invisible to flight crews, thus not requiring Level D simulator training.[41] The software design was intended to take care of any funky performance characteristics in remote corners of the flight envelope that airline pilots would never encounter, so the company saw no reason to disclose its operation to flight crews.[42]

Computerized flight-control system interventions are a pervasive feature of modern jetliners. The design philosophy of Airbus aircraft, beginning with the A320 series in the mid-1980s, is to interpose quite a

39. U.S. Dep't of Transp., Fed. Aviation Admin., Advisory Circular No: 120–53B app. 2 at 7 (2013).

40. This is why it is not correct to say that the 737-MAX flew differently from the NG. The effects of the larger engines that would have been apparent to the flight crew would have occurred during maneuvers that no airline crew should have been anywhere close to attempting. This is not a pedantic point. It appears to have factored into the judgment by Chief Technical Pilot Mark Forkner to recommend that MCAS not be discussed in the 737-MAX Flight Crew Operations Manual. *See infra* note 69.

41. Boeing reportedly had a provision in its contract with Southwest Airlines for the purchase of 737-MAX aircraft providing Southwest, which operates a huge 737NG fleet, with a $1 million per airplane rebate if the FAA ultimately required Level D simulator training for pilots transitioning from the NG to the MAX. *See* Reuters Staff, *Southwest had $1mln per 737 MAX rebate clause on training*, Reuters, Oct. 30, 2019; House Transp. Comm. Rep., *supra* note 6, at 17.

42. House Transp. Comm. Rep., *supra* note 6, at 118 (quoting presentation by Chief Technical Pilot Mark Forkner indicating that MCAS was intended to comply with FAA certification requirements, functioned only outside the normal operating envelope of the aircraft, and did not affect the flight characteristics as compared with the 737NG).

bit of software wizardry between pilots and the aircraft.[43] Even Boeing aircraft, however, allow automated systems to make small control inputs to optimize performance. The 737NG incorporated a flight-control function called Speed Trim System (STS), which under certain conditions would make changes to the stabilizer trim as needed to return the airplane to the airspeed it had been trimmed for. Once the role for MCAS was established in smoothing out the aerodynamic effects created by the larger engines, Boeing managers determined that it would be considered an extension or modification of the existing STS for the purposes of certifying the system on the 737-MAX.[44]

The following is the pivotal judgment to be made when evaluating the decisions of Boeing managers and engineers regarding the safety of the 737-MAX design: *Was the incorporation of MCAS such a substantial change from the 737NG design, including STS, that it should have been disclosed more clearly to the FAA?* Boeing wanted to avoid this disclosure because it would have led to the FAA requiring Level D training for flight crews transitioning to the MAX, as well as additional information in the Flight Crew Operations Manual (FCOM) that is certified along with every aircraft. However, it is not clear that Boeing did not have a reasonable position—or at least would not have had one, had it not permitted design defects to be incorporated into MCAS and the 737-MAX. Even with the benefit of hindsight and the Lion Air and Ethiopian Airlines accidents, many observers continue to believe that a properly designed MCAS could have been brought

43. On an Airbus, for example, sidestick inputs do not translate directly into deflections of the control surfaces, as they do on Boeing aircraft, but to performance parameters (this is weird for pilots of aircraft with conventional flight controls, but maybe more intuitive for non-pilots). For example, full back stick on an Airbus is interpreted by the computer as a demand for maximum climb performance, while on a Boeing aircraft it will result in full up elevator deflection. In a way the Airbus philosophy makes good sense. Any pilot slamming the flight controls all the way back to the stops is undoubtedly looking to climb in a hurry to avoid terrain or escape windshear, so why not have the computer set the pitch of the aircraft for best climb performance? The Airbus philosophy was initially met with skepticism by many pilots experienced on aircraft with conventional flight control systems, however, who did not like the fact that they, not some mysterious box, would not ultimately be the ones in charge of what the plane was doing. For a time the saying "if it ain't Boeing, I ain't going," was popular among pilots. However, the safety of the Airbus design philosophy has been vindicated by decades of use on not only the A320 but on several widebody aircraft families—the A330, A340, A350, and A380. All of these aircraft have an extraordinary safety record and are in widespread use around the world. My admittedly incomplete understanding of Airbus flight control systems comes from a book by an A330 training captain for a major U.S. airline. *See* BILL PALMER, UNDERSTANDING AIR FRANCE 447 (2013).

44. *See* HOUSE TRANSP. COMM. REP., *supra* note 6, at 92, 99. Interestingly, something like the MCAS system is also used on the Air Force KC-46 tanker, which is a derivative of the Boeing 767 airliner. *See id.* at 102.

within the existing STS.[45] If that were the case, then any malfunction in the system should have been capable of being addressed safely by flight crews. But here is where it is clear that the MAX fails the test of a reasonably safe design, understood in either risk-utility or consumer-expectation terms. In risk-utility terms, Boeing's implementation of MCAS involved design choices that introduced excess risk with no corresponding utility. In consumer-expectation terms, even a sophisticated consumer—say, a type-rated and current 737NG pilot—would not expect MCAS to perform in the way it did.

In products liability terms, MCAS had at least two design defects: (1) It was unnecessarily aggressive and (2) it depended on data inputs from a single angle of attack (AOA) sensor on the captain's side, even though the aircraft had an AOA sensor on both sides of the nose.[46] Arguably it had a third, hybrid design and informational flaw, namely that (3) it did not provide an indication to flight crews that it was operating. In addition, the 737-MAX design should be deemed defective for failure to provide adequate information, i.e., including a suitable description of MCAS in the Flight Operations Manual used by pilots of the aircraft.

On the first defect, MCAS had initially been designed to make relatively gentle nose-down pitch changes, not to exceed 0.6 degrees (out of a physical maximum of 5.0 degrees) pitch up or down. However, when additional flight testing revealed that the new engines also caused a pitch-up tendency at lower airspeeds, MCAS was modified to become more aggressive, since smaller stabilizer trim changes would have less effect at lower airspeeds.[47] The redesigned MCAS now could

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45. *See, e.g.*, William Langewiesche, *What Really Brought Down the 737 Max?*, N.Y. TIMES MAG., Sept. 18, 2019; James Fallows, *Here's What Was on the Record About Problems with the 737 Max*, ATLANTIC, Mar. 13, 2019. Langewiesche and Fallows are both pilots and experienced aviation journalists. Langewiesche, for example, wrote a detailed, but highly readable, account of the engineering and aeronautical aspects of US Airways #1549, the "Miracle on the Hudson." *See* WILLIAM LANGEWIESCHE, FLY BY WIRE: THE GEESE, THE GLIDE, THE MIRACLE ON THE HUDSON (2010). He is the son of Wolfgang Langewiesche, whose classic textbook is cited above, LANGEWIESCHE, STICK AND RUDDER, *supra* note 34. Fallows is the co-author of the book, OUR TOWNS: A 100,000 MILE JOURNEY INTO THE HEART OF AMERICA, which was turned into an HBO movie, and which featured him and his wife tooling around the country in their single-engine Cirrus SR-22.

46. *See* Gates & Baker, *supra* note 34. The reporting by Dominic Gates, an experienced aviation journalist who had covered Boeing for many years for what was formerly the company's hometown newspaper, is the best popular and readily accessible explanation of MCAS in general, and particularly the significance of the design changes made to MCAS in the certification process.

47. *Id.*; *see also* Dominic Gates, *Flawed Analysis, Failed Oversight: How Boeing, FAA Certified the Suspect 737 MAX Flight Control System*, SEATTLE TIMES, Mar. 17, 2019; Jack Nicas et al., *Boeing Built Deadly Assumptions Into 737 Max, Blind to a Late Design Change*, N.Y. TIMES, June 1, 2019.

command up to 2.5 degrees of nose-down pitch in response to an indication of a high angle of attack. This considerably more rapid trim change demanded correspondingly quicker reactions by flight crews in the event of an inadvertent operation of the system. It also was permitted to activate repeatedly, leading pilots to fight the system that was trying to force them into a dive.

Regarding the second defect, the operation of MCAS relied upon air data input from only one of two AOA sensors ("vanes") on the nose of the aircraft, as opposed to having the system compare the readings from both sensors. (Presumably some computing logic could be incorporated into the system to deal with a disagreement between the two AOA values.) That left MCAS vulnerable to incorrect operation if one of the AOA vanes sent in unreliable data. The aircraft that crashed as Lion Air 610 had come into Jakarta with a malfunctioning AOA sensor; however, that crew did not write up the problem, so the flight 610 crew took out the plane without awareness of the maintenance issue.[48] A bird strike on climb-out is believed to have destroyed the captain's side AOA sensor on the Ethiopian 302 accident aircraft.[49] In both cases, faulty AOA data was input to the flight management computer, leading it to believe that the aircraft was in one of those very unusual low speed, high AOA situations calling for a nudge of nose-down trim. As noted above, however, the MCAS system provided more than a nudge, but instead activated repeatedly and very aggressively. Because the flight crews perceived, correctly, that they were in a normal climb attitude, they could not understand why an automated system on the aircraft was trying to push the nose down. They reacted understandably by applying back pressure to the control yoke, but this merely prompted MCAS to reintroduce nose-down trim. If crews had been informed about the existence of MCAS, they would have been more likely to correctly diagnose the problem and respond appropriately.

Third, because there was no visible or aural alert that MCAS was operating, the Lion Air and Ethiopian crews were deprived of information that would have helped them troubleshoot the problem. Some pilots have criticized the crews for not immediately pulling cutout switches located near the throttles which would have disabled all electric pitch trim, reverting control to the manual trim wheels. Flight crews are trained to react this way to a "trim runaway," caused by any

48. *See* Langewiesche, *supra* note 46; Dominic Gates, *FAA Shuts Down Florida Repair Firm That Supplied Faulty Lion Air Sensor on Boeing 737 MAX*, SEATTLE TIMES, Oct. 25, 2019.

49. Alison Sider & Andy Pasztor, *Boeing Official Played Down Scenario That May Have Doomed Ethiopian Jet*, WALL ST. J., May 21, 2019.

anomaly in the electric pitch trim system.[50] Given the aggressiveness of MCAS, however, one of the pilots would have had to pull the stabilizer trim cutout switches very quickly. In an emergency, startle effects often delay diagnosis of a problem for several seconds.[51] The original MCAS design was so aggressive that the nose-down pitch attitude might not have been recoverable if the crews delayed more than three seconds.[52] Having a visual or aural annunciation of MCAS operation could have cued the flight crews promptly to the nature of the problem, allowing them to take appropriate corrective action.[53]

The information defect, which is the failure to even mention, let alone provide an adequate explanation of MCAS in the 737-MAX Flight Crew Operations Manual (FCOM), significantly exacerbated the effects of the design defects. MCAS operated when it should not have, and the flight crews had no idea what was going on. Section 2(c) of the Third Restatement provides that a product is defective when

50. *See* Fallows, *supra* note 46; HOUSE TRANSP. COMM. REP., *supra* note 6, at 111.

51. Boeing's own test pilots delayed up to ten seconds in reacting to an uncommanded MCAS activation in the simulator. HOUSE TRANSP. COMM. REP., *supra* note 6, at 87, 113. Reaction-time delays can be much worse in the real world, as contrasted with simulator training sessions in which pilots tend to be spring-loaded for something to go wrong.

52. This is due to aerodynamic effects resulting from the high airspeed in a dive. Manually trimming the nose up would have been impossible given the load on the stabilizer. HOUSE TRANSP. COMM. REP., *supra* note 6, at 116. Holding back-pressure against nose-down trim would be exhausting and probably eventually futile. Once a critical airspeed was exceeded, the only feasible recovery technique would have been a wild procedure known as a roller-coaster, involving a highly counterintuitive pitch *down* with the elevator, temporarily relieving enough aerodynamic pressure to allow rapid nose-up trim inputs, returning to neutral controls, and then repeating as necessary until the plane was trimmed for level flight. I have seen references in online airline pilot discussion forums to training on the roller-coaster procedure for 737 Classic crews in the 1990's, but to the best of my knowledge no airline trained that procedure on the 737NG. *See* Dominic Gates, *Why Boeing's Emergency Directions May Have Failed to Save 737 Max*, SEATTLE TIMES, Apr. 3, 2019 (noting that an Australian pilot had posted and discussed the roller-coaster technique as described in a 1982 manual). In any event the roller-coaster procedure requires thousands of feet of altitude to complete, which Lion Air 610 and Ethiopian 302 did not have. *See* Dominic Gates, *How Much Was Pilot Error a Factor in the Boeing 737 Max Crashes?*, SEATTLE TIMES, May 15, 2019. It did not help that the Ethiopian 302 crew did not immediately reduce power from the climb setting when observing the nose-down pitch attitude, which should have been an instinctive reaction. However, in my judgment, is unreasonable to fault them for not being quicker on the stabilizer trim cutouts. Three seconds goes very quickly during an in-flight emergency and it is difficult to focus one's attention when multiple alerts are sounding simultaneously. *See Ethiopian MAX Crash Simulator Scenario Stuns Pilots*, AVIATION WK. NETWORK, May 10, 2019; Scott McCartney, *Inside the Effort to Fix the Troubled Boeing 737 MAX*, WALL ST. J., June 5, 2019. What a test pilot in a simulator may be able to do, particularly with foreknowledge of the situation, is not relevant to the standard of care for a line pilot in normal operations. *See* Hadra Ahmed et al., *Ethiopian Airlines Pilots Followed Boeing's Safety Procedures Before Crash, Report Shows*, N.Y, TIMES, Apr. 4, 2019.

53. *See* HOUSE TRANSP. COMM. REP., *supra* note 6, at 19 (citing human factors experts who testified that an MCAS-specific alert, not incorporated into the existing speed trim failure warning, would have helped pilots diagnose the problem).

the manufacturer provides "inadequate instructions or warnings."[54] Boeing believed that MCAS was merely an enhancement or modification to the existing Speed Trim System (STS), which framed its approach to informing pilots of MCAS operation. There was no additional information in the FCOM beyond the existing procedures for handling a stabilizer trim runaway. The reason for the omission was likely the assumption that, because MCAS operated only in conditions far outside the normal operating envelope of the aircraft, there was no reason for flight crews to know anything about it.[55]

All of these defects have been rectified as part of Boeing's lengthy and costly program of returning the 737-MAX to airline service. The new and improved MCAS relies on data from both the captain's and first officer's side AOA vanes, makes only limited nose-down pitch changes, and operates only once.[56] It is fully disclosed in the FCOM and Boeing has agreed to recommend that Level D simulator training will be required before current 737NG pilots can operate the MAX.[57] Inadvertent MCAS operation is one of the scenarios encountered in the sim by crews transitioning to the MAX. For the purposes of analysis, as opposed to adjudication of products liability claims,[58] these subsequent remedial measures are compelling evidence of the design and informational defects that proximately caused the Lion Air 610 and Ethiopian Airlines 302 crashes.

III. Organizational Culture Defects at Boeing: Slouching Towards Disaster.

What possible justification could Boeing have for not doing it the right way the first time around? The answer to this question has significant implications for Boeing's exposure to punitive damages. There

54. Restatement (Third) of Torts § 2(c) (Am. L. Inst. 1998).

55. House Transp. Comm. Rep., *supra* note 6, at 119 (reporting on interaction between FAA representative and Boeing Chief Technical Pilot Mark Forkner, who was subsequently prosecuted for making false statements to the FAA).

56. Boeing's website describes the changes that have been made to MCAS that likely would have prevented the Lion Air 610 and Ethiopian 302 accidents:

> Measurements from two Angle of Attack (AOA) sensors will be compared. Each sensor will submit its own data to the airplane's flight control computer. MCAS will only be activated if both sensors agree. MCAS will only be activated once. MCAS will never override the pilot's ability to control the airplane using the control column alone.

What Does MCAS Do?, Boeing, https://www.boeing.com/737-max-updates/mcas/ (last visited Feb. 20, 2023). These changes bring MCAS on the 737-MAX into line with MCAS on the Air Force KC-46 tanker. *See* House Transp. Comm. Rep., *supra* note 6, at 102–03.

57. House Transp. Comm. Rep., *supra* note 6, at 141.

58. Fed. R. Evid. 407 ("When measures are taken that would have made an earlier injury or harm less likely to occur, evidence of the subsequent measures is not admissible to prove . . . a defect in a product or its design; or a need for a warning or instruction.").

are at least two explanations for what, with the benefit of hindsight, were egregious failures by a once highly respected engineering company. One is an explanation consistent with the malice needed to support punitive damages: Boeing executives were riding a wave of profitability, high stock prices, and personal financial gains generated by the success of the 737-MAX program. Grounding the worldwide MAX fleet while developing and certifying a design fix would cost the company and its executives dearly. Call this the nefarious version of the conventional-wisdom account presented in the introduction to this paper. The other explanation can be referred to as the SNAFU version of the conventional-wisdom account: Boeing was in fact motivated by the desire to offer a competitor to the A320neo and as a result developed a kind of tunnel vision approach to designing and certifying the 737-MAX. The obsession with marketing an aircraft that current 737NG crews could operate without Level D simulator training led to a decision frame in which design changes were understood as insubstantial relative to the existing NG design, which had an outstanding safety record. Those design goals influenced the way subsequent changes were understood, and the failure to fully appreciate the effect of those changes was exacerbated by information siloing and fault reporting structures within the company.

The SNAFU version of the account is complicated, but in essence relies on a series of decisions, each of which appeared to be reasonable at the time and in its context. The critical safety problems emerged only when one step in the process was considered in conjunction with other decisions. However, no individual, committee, department, or other decisionmaking authority had the whole process in a synoptic view.[59] Thus, no one perceived the substantial increase in risk inherent in the design of the 737-MAX that had been introduced in a stepwise fashion. The House Transportation Committee Report found: "[t]hroughout the certification process, oversight of MCAS was fragmented and marred by confusion. Various references to MCAS were included in multiple FAA-related records, but FAA did not have a

59. The former Chief Project Engineer on the 737-MAX project testified that when he approved the MCAS redesign:

> [H]e was unaware: 1) that MCAS operated from a single AOA sensor, 2) that MCAS could activate repeatedly, or 3) that Boeing had internal test data showing that one of its own test pilots took more than 10 seconds to react to uncommanded MCAS activation in a flight simulator, and described the results as "catastrophic."

House Transp. Comm. Rep., *supra* note 6, at 21. He described a chaotic reporting structure in which none of the engineers on the project reported to him, yet they all reported to him. As the House Committee concluded, this "structure contributed to an overall lack of accountability on the MAX program." *Id.* at 22.

holistic understanding of MCAS or the potential implications of its operations on the aircraft or the flight crew."[60]

To be clear, a fragmented, confused oversight process and failure to have a holistic understanding of the safety implications of design changes is a significant problem for a manufacturer of products accompanied by significant risks if not designed properly. A well-managed organization ought to strive to mitigate the risks created by information cascades, groupthink, stubborn adherence to prior decisions, and similar tendencies. However, there is a logical and normative gap between a judgment that an organizational culture is faulty and a judgment that the organization's conduct was so reprehensible as to warrant the imposition of punitive damages. There is an explanation for the 737-MAX failures that exists in the middle ground between negligence and the kind of wanton disregard for human life and safety that is a prerequisite for punitive damages.

One plausible version of the SNAFU explanation, drawn from the report of the House Transportation Committee, goes like this:

1. Boeing test pilots report that the aircraft has a tendency to pitch up during high speed wind-up turns.[61] This tendency violated the regulatory requirement that stick forces be linear throughout the aircraft's entire maneuvering envelope, but would not present issues for airline pilots in the course of normal operations.
2. One possible fix would be to make physical changes to the airframe, such as adding vortex generators. However, Boeing had committed itself to the MAX flying similarly enough to the 737NG that full-motion simulator training would not be required. Thus, managers rejected this possibility.
3. Someone came up with the idea of modifying the Speed Trim System (STS), which already existed on the 737NG and ran in the background, without the knowledge of flight crews.[62]
4. Because the pitch-up tendency occurred only in high-speed, accelerated flight, the software-driven response could be triggered on the occurrence of two events: High angle of attack and acceleration as measured by G-forces.[63] MCAS was designed to operate only when both of those conditions were satisfied.

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60. *Id.* at 101.
61. *See* United States v. Forkner, 584 F.Supp.3d 180, 183 (N.D. Tex. 2022).
62. House Transp. Comm. Rep., *supra* note 6, at 99.
63. This is an important point that sometimes is overlooked in discussion of the single point of failure defect in MCAS. The original design relied on both AOA and G-forces and thus did not

5. Subsequent testing revealed a pitch-up tendency in some low-speed flight conditions.[64] The G-force trigger was therefore removed from the MCAS control logic. Now MCAS operation depended only on angle of attack data.
6. The possibility of an inadvertent ("uncommanded") operation of MCAS was considered, but critically was framed by engineers as a subset of the general problem of trim runaway. 737NG pilots are familiar with the procedure for handling a trim runaway, which is to pull the stabilizer trim cutout switches.[65] Because this reaction by flight crews is considered likely, and because MCAS was not believed to be activated during normal operations, the possibility of an uncommanded MCAS activation is not deemed critical to safety of flight—merely "[h]azardous" and not "catastrophic," in risk-management terms.[66]
7. Some Boeing test pilots who experienced an uncommanded MCAS operation in the simulator noted that it is more aggressive than an ordinary trim runaway. They reported that it took as long as ten seconds to respond correctly to the situation and wondered whether the MCAS system should be redesigned. This experience was investigated and determined by Boeing to have resulted from an error in programming the simulator.[67]
8. The failure condition of "catastrophic" was used in internal Boeing documents to describe the possibility of an uncommanded MCAS activation, but this information was never shared with the FAA.[68] One explanation for this failure is that Boeing pilots familiar with the operation of MCAS had learned about the system before it was modified to make more aggressive trim inputs.[69]

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have a single point of failure. *See* Jack Nicas et al., *Boeing Built Deadly Assumptions Into 737 Max, Blind to a Late Design Change*, N.Y. TIMES, June 1, 2019. The G-force trigger was removed later, when the pitch-up tendency was discovered in low-speed flight.

64. HOUSE TRANSP. COMM. REP., *supra* note 6, at 103.

65. *Id.* at 111.

66. *Id.* at 21, 113–15.

67. Dominic Gates, *Why Boeing Pilot Forkner Was Acquitted in the 737 MAX Prosecution*, SEATTLE TIMES, Mar. 25, 2022.

68. HOUSE TRANSP. COMM. REP., *supra* note 6, at 25, 115.

69. *Id.* at 118–19. The Committee noted that it could not reach a conclusion regarding whether Chief Technical Pilot Mark Forkner had been informed about changes to MCAS when he recommended to the FAA that MCAS not be mentioned in the FCOM. *See also* Andrew Tangel & Andy Pasztor, *Boeing's Own Test Pilots Lacked Key Details of 737 MAX Flight-Control System*, WALL ST. J., May 3, 2019.

9. Although some engineers raised the issue, no one at Boeing in a position of authority to order design changes was aware that the possibility of uncommanded MCAS operation was associated with a catastrophic risk. This was due to the assumption that flight crews would have sufficient time to react as if the MCAS operation was an ordinary trim runaway.[70] However, the faster, repeated nose-down trim inputs commanded by MCAS were qualitatively different, from the point of view of what pilots would expect in a trim runaway situation. Thus, no one at Boeing questioned the reliance on a single source of AOA data as a condition for the operation of MCAS.[71]

To summarize the House Committee Report's findings, the assumption that an MCAS malfunction could be handled as an ordinary trim runaway remained baked into the decisionmaking process, despite the reports by Boeing test pilots that it could take as long as ten seconds to react to the loss of control and, if uncorrected during that time, the nose-down pitch attitude would be unrecoverable. The project leader for the 737-MAX never learned about the reservations expressed by company engineers because, as he testified, they did not report directly to him but were "all functionally aligned to the engineering leaders of the company."[72] The interactions between Chief Technical Pilot Mark Forkner and the FAA, for which Forkner was subsequently criminally prosecuted and acquitted, were informed by Forkner's experience with the earlier, gentler version of MCAS.[73] Engineering documents shared with Boeing pilots were not updated with information about the increasingly aggressive operation of MCAS and the possibility that it might be triggered in low-airspeed situations.[74] The company's goal of avoiding required Level D simulator training for pilots transitioning from the 737NG to the MAX seems to have entered the process at an early stage, possibly influencing the framing of MCAS as nothing more than an addition to the existing STS and the expectation that pilots would deal with an uncommanded MCAS activation in the same way they would handle any other stabilizer trim runaway.

70. HOUSE TRANSP. COMM. REP., *supra* note 6, at 109, 116.

71. *Id.* at 108–09.

72. *Id.* at 117.

73. Andrew Tangel & Andy Pasztor, *Boeing's Own Test Pilots Lacked Key Details of 737 MAX Flight-Control System*, WALL ST. J., May 3, 2019; Dominic Gates, *Why Boeing Pilot Forkner Was Acquitted in the 737 MAX Prosecution*, SEATTLE TIMES, Mar. 25, 2022 ("Testimony for the prosecution by a senior Boeing engineer failed to convince the jury that Forkner had really known the details of the flight control change.").

74. Gates, *supra* note 74.

This may be an unpopular position, but it seems to me that the burden is on proponents of the nefarious version of the story to show that corporate greed, callously trading lives for dollars, or the pervasive influence of a cost-cutting mentality is a more likely explanation than potentially negligent but not callous organizational dynamics—the SNAFU explanation. The late psychologist John Darley has argued that the "bad apples" account, relying on "persons searching for corrupt opportunities [who] were blinded to the probabilities of detection by their greed," is merely a "useful fiction" that excuses attention to comprehensive efforts at organizational redesign.[75] Admittedly, the nefarious story is appealing. People tend to seek characterological explanations for bad behavior. Someone lied because they are dishonest, not because they are rushed, careless, or under pressure; corporations engage in wrongdoing because managers are greedy or callous, not because the decisionmaking structure is a mess. Behavioral psychologists have consistently found, however, that while observers tend to explain actions with reference to the personality traits or dispositions of actors, they overlook the importance of situational factors that channel behavior—often unconsciously—in predictable ways.[76] As shown in a classic experiment, the fact that someone is in a hurry is more likely to affect their decision to help a person in obvious distress than the fact that they are a student studying for the ministry or that they had recently been asked to reflect on the parable of the Good Samaritan.[77] Similarly, the tendency of players to keep their mouth shut or rat out the other player in a Prisoner's Dilemma game is powerfully influenced by the framing effect of telling the players that the game is called either the Wall Street Game or the Community Game.[78]

To emphasize, the findings of empirical psychology should not be taken to undermine the practice of ascribing moral responsibility to people who engage in wrongful actions. The mainstream view within moral psychology understands behavior as a complex product of the

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75. John M. Darley, *The Cognitive and Social Psychology of Contagious Organizational Corruption*, 70 BROOK. L. REV. 1177, 1178 (2005).

76. *See, e.g.*, LEE ROSS & RICHARD E. NISBETT, THE PERSON AND THE SITUATION (1991); Lee Ross, *From the Fundamental Attribution Error to the Truly Fundamental Attribution Error and Beyond: My Research Journey*, 13 PERSP. PSYCH. SCI. 750, 751–52 (2018).

77. *See* John M. Darley & Daniel Batson, *From Jerusalem to Jericho: A Study of Situational and Dispositional Variables in Helping Behavior*, 27 J. PERSONALITY & SOC. PSYCH. 100, 100–01 (1973).

78. *See* Varda Lieberman et al., *The Name of the Game: Predictive Power of Reputation Versus Situational Labels in Determining Prisoner's Dilemma Game Moves*, 30 PERSONALITY & SOC. PSYCH. BULL. 1175, 1176–77 (2004).

interaction between personality traits and situational factors.[79] Standards of conduct, whether moral or legal, may require people to do things that are difficult, to overcome unconscious tendencies, or to counteract organizational dysfunctions. For example, someone within Boeing should have ensured that its representatives discussing the content of the 737-MAX Flight Crew Operations Manual had full information about the changes that had been made to MCAS since the system was first introduced, or that there were clear and unambiguous lines of communication established between various engineering departments and the Chief Project Engineer for the aircraft. These failures can be deemed departures from the standard of care even if, in some sense, they are understandable effects of a complex, decentralized, bureaucratic organizational culture.

Just as situational factors can be taken into account in mitigating the punishment for criminal offenses, the judgment of reprehensibility that is a prerequisite for the imposition of punitive damages can be sensitive to the factors that may have played a role in producing a tragic outcome. The coexistence of two competing explanations—a nefarious version and one that understands a tragic outcome as the result of an organizational SNAFU—is a feature of many high-profile disasters. Because humans naturally tend to seek an explanation for bad outcomes that refers to the character of actors as careless, greedy, stupid, corrupt, and so on, these events often function in popular understanding as morality plays. In fact, however, they are often cautionary tales about the critical importance of good organizational structures and decisionmaking processes. The next section considers two such examples, the decision to launch the space shuttle *Challenger* and the delayed response by General Motors to accidents caused by a defective ignition switch. Both of these cases have come to stand in the public imagination as examples of corporate greed or trading lives for dollars. In fact, however, they are better understood as culpable, but not reprehensible cultural failures.

IV. We've Seen This Movie Before: Cultural Failures in Safety-Critical Environments.

A. The Challenger Launch.

Everyone my age remembers the loss of the space shuttle *Challenger*, in January 1986. I was in high school, and all the students were paying attention because Christa McAuliffe was going to be the first

79. *See* John Doris et al., *Moral Psychology: Empirical Approaches*, Stan. Encyclopedia Phil. (2020).

teacher in space. Instead, we watched the shuttle disintegrate in a tremendous explosion seventy-three seconds after liftoff. The cause was a failure of a rubber O-ring in the solid rocket booster assembly manufactured by Morton Thiokol. The O-ring failure allowed pressurized hot gases to shoot out of a joint in the solid rocket booster, melt through the hydrogen fuel tank, and ignite an enormous fireball. All seven members of the crew were killed in the explosion or upon impact with the ocean.

Engineers at the contractor had observed problems with the O-rings stiffening in low temperature conditions. One of the engineers at Thiokol, Roger Boisjoly, later became known as a whistleblower and truth-teller who had argued against the launch, due to forecast temperatures near freezing for the scheduled launch time.[80] Boisjoly had previously written a memo warning about the O-ring issues, in which he predicted "a catastrophe of the highest order" if launch temperatures were too low. A powerful folklore version of the *Challenger* launch story has grown up, in which Boisjoly heroically tried to prevent the launch, but was shot down by managers at NASA and Thiokol, one of whom notoriously told the engineers to take off their engineering hat and put on their management hat.[81] On this version of the story, the engineering values and ethical commitment displayed by Boisjoly and a few others was steamrollered by the "management" decision made by executives at Thiokol and high-ranking NASA officials.

In fact, the folklore version of the story isn't quite right, but the actual story turns out to be more interesting when considered from the perspective of subtle situational factors that can have a decisive influence on decisionmaking. Diane Vaughan, an organizational and management sociologist, added some important nuances to the explanation of the accident in her excellent book, *The Challenger Launch Decision*. She acknowledges the persistence of the folklore version of the story, but annotates it in important ways with detailed findings of her investigation. On her version, the controversy on the eve of the launch resulted from inadequate testing of the cold-temperature performance of the O-rings, due to the assumption that launches would occur in Florida with its generally warm temperatures. As a result, there was a considerable zone of uncertainty between the forecast launch temperatures and the data on O-ring performance. On a con-

80. *See, e.g.*, Howard Berkes, *Remembering Roger Boisjoly: He Tried to Stop Shuttle Challenger Launch*, NPR: ALL THINGS CONSIDERED, Feb. 6, 2012; Douglas Martin, *Roger Boisjoly, 73, Dies; Warned of Shuttle Danger*, N.Y. TIMES, Feb. 3, 2012.

81. VAUGHAN, *supra* note 14, at 6, 308.

ference call with NASA the night before the scheduled launch, Thiokol engineers somehow coalesced around a number: The launch should not take place below 53 degrees Fahrenheit. Why that number?, NASA demanded, particularly when there were other data showing acceptable O-ring performance down to 25 degrees.[82] The sudden appearance of the seemingly arbitrary 53 degree criterion provoked a high-ranking NASA official to say he was "appalled" at the recommendation not to launch, and another to ask incredulously, "when do you want me to launch, Thiokol, next April?" NASA engineers on the call poked holes in the data submitted by Thiokol and noted that there had always been issues with the O-rings, but they were not correlated with temperature.[83] NASA ultimately concluded that Thiokol's engineering argument was weak.

It may have also been significant that there had already been three aborted launches and one delay on the previous shuttle mission, involving the *Columbia*, setting a NASA record for delays. Perhaps due to their embarrassment over the delays in the previous *Columbia* launch, NASA managers reframed the burden of proof for a launch recommendation, contending that the decision should be to go unless there was conclusive data proving that the launch would entail unacceptable risks. This was different from the usual NASA approach of resolving doubts against the go decision. The decision now focused on this seemingly arbitrary number, and the question subtly shifted from whether there were good reasons to doubt the safety of the launch to whether the evidence supported the 53 degree cutoff. With no good reason to believe in the magic number of 53 degrees, the group coalesced around the decision that the launch would be a go.

The next morning, the ambient temperature at the time of launch was 36 degrees Fahrenheit. The engineers who had argued against the launch were initially relieved, because they expected any problems with the O-rings to manifest right at the time of liftoff. However, they were devastated when they witnessed the explosion at the seventy-three second mark. After an extensive investigation, blame for the accident was placed, technically, on the O-rings, but also on "'a flawed decision-making process,'"[84] suggesting that the engineers succumbed to pressure to launch due to both delays in the previous *Columbia* mission and the media attention surrounding the Teacher in Space Project and the upcoming State of the Union address.

82. *Id.* at 309.
83. *Id.* at 306.
84. *Id.* at 11.

As noted above, many popular discussions of the *Challenger* launch talk about it as a management vs. engineering decision, and identify as the fatal flaw the suggestion that engineers put on their management hats. But a detailed review of the teleconference on the eve of the launch shows that everyone involved as thinking like an engineer—they just disagreed about what the data showed. Some of the participants interpreted the comment about putting on management hats as simply acknowledging that there was disagreement among the engineers, and so now a decision had to be made about whether to go forward with the launch. But a careful look at the events on the night before the launch does not reveal a conflict between management values and the overriding engineering value of safety. Everyone *was* thinking like an engineer, only disagreeing about what was the best engineering decision. The decisive moment in the group's process was somehow getting obsessed with the 53 degree number as a new launch criterion. When it became apparent that the number was inconsistent with the data presented by Thiokol and also the company's behavior in previous launches, the arguments against launching due to cold temperatures lost credibility. The notorious quotes that are associated in the public mind with the launch decision—that a NASA manager is "appalled" at the recommendation not to launch, and "[m]y God do you want to delay until next April"—occurred in the context of a vigorous discussion of the 53 degree threshold, which seemed to come out of the blue.[85] The snap judgment was to establish 53 degrees as a new launch criterion in general, not the decision to launch in this particular case.

Vaughan argues that a consideration of the decisionmaking process on the eve of launch is not enough. The analysis must go back into the history of the design of the space shuttle and its component parts. She coined the now well-known phrase, "normalization of deviance," to describe a process in which a product or procedure may be unsafe, but if it does not result in an accident in the short term, it comes to be perceived as an acceptable risk. In psychological terms, the lack of an immediate catastrophe affects the construal of the situation. The fault is not perceived as a danger, and eventually the risk fades from consideration. The risk assessment by engineers at NASA, Thiokol, and other contractors was undertaken with recognition that risk-free space travel is impossible. Some risk must be accepted—the question is simply how much risk is unacceptable, and how to decide when that threshold has been reached. NASA had what it called an Acceptable

85. *Id.* at 310–11.

Risk Process to determine whether an observed anomaly should prevent a launch. Physicist Richard Feynman, a member of the Presidential Commission reviewing the *Challenger* launch, believed that the language of "acceptable risk" had a pernicious framing effect on the way particular risks are analyzed.[86] Linguistic choices have the power to convey the core values of an organizational culture.[87] It is possible that the final decision, affected as it was by the scrutiny of Thiokol's 53 degree criterion, was also influenced by the normalization of deviance. There had been problems with the O-rings on previous launches and in testing, but none had led to a catastrophic failure. This may have led the participants in the eve-of-launch teleconference to discount, to some extent, what the Thiokol engineers were worried about when they presented their reservations about O-ring performance at low temperatures.

B. The General Motors Ignition Switch Fiasco.

An organizational culture defect was at the center of a safety crisis experienced a decade or so ago by another prominent American manufacturing company, General Motors. A faulty ignition switch used in several GM cars, including the Chevrolet Cobalt and Saturn Ion, would sometimes fail in a way that both shut off the engine and disabled the car's airbags.[88] The switch departed from its intended design in a crucial respect—the torque was less than specified, so that if a driver inadvertently bumped into it, or if the keys hanging from the ignition switch were too heavy, the electrical system might change from "run" to "accessory" mode. This cut the electrical power to the car's airbags, but it was a reasonable design choice given the risk posed by airbags going off in parked cars and causing injuries to passengers not belted into their seats.[89] Engineers dealing with ignition switch problems reported by customers failed to appreciate the safety issue posed by loss of electrical power to the airbags while the car was in motion because they were focused on the risk presented by the loss

86. *Id.* at 82.

87. BAZERMAN & TENBRUNSEL, *supra* note 1, at 122–24.

88. *See, e.g.*, Hilary Stout, *After a G.M. Recall, a Fiery Crash and a Payout*, N.Y. TIMES, Sept. 25, 2014; Hilary Stout et al., *For a Decade, G.M. Response to a Fatal Flaw Was to Shrug*, N.Y. TIMES, June 5, 2014; Rebecca R. Ruiz, et al., *13 Deaths, Untold Heartache, From G.M. Defect*, N.Y. TIMES, May 26, 2014. Anton Valukas, a former United States Attorney, and the Chicago law firm of Jenner & Block were retained by the G.M. Board of Directors to investigate and prepare a report, which is an invaluable source for understanding the problem. *See* VALUKAS REPORT, *supra* note 19.

89. *See* VALUKAS REPORT, *supra* note 19, at 27–28.

of engine power.[90] As a result, the problem was classified as a "customer convenience" issue rather than a safety problem.[91] The cost of responding to a problem could be taken into account if the problem was classified as presenting only customer convenience concerns, which would not have been the case for something on the safety track.[92]

The belated recognition that the ignition switch problems raised safety issues led to the response being bogged down in a byzantine structure of review programs, tracking systems, and cross-disciplinary committees that exists precisely to detect and rectify issues like the ignition switch defect.[93] Customer satisfaction issues, which comes to the attention of GM personnel involved in marketing, are supposed to get directed to engineers for improvement.[94] Managers from divisions of products, systems, and safety engineering periodically met with business managers to work on solutions to anything classified as a safety problem.[95] Additional committees dealt with problems manifesting themselves in the field, and had contact with representatives from engineering, marketing, business, and legal teams.[96] Reading the description of these procedures and protocols, one comes away with the impression of a company that took its obligations to customers quite seriously, but had the energy of its response sapped by the redundancy and ambiguity inherent in its decisionmaking structure. With multiple committees dealing with various aspects of the same problem, no person or centralized team had responsibility for making sure something got done. CEO Mary Barra memorably testified before Congress about the "G.M. nod," when everyone in the room agrees with a proposed plan of action, but no one does anything to make it happen, and the "G.M. salute," which consists of crossed arms with fingers pointing toward others, to whom responsibility is being punted.[97]

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90. *See id.* at 64–65.

91. *See id.* at 59, 75.

92. *See id.* at 53–54, 64.

93. *See id.*, at app. B, 282–91 (summarizing systems maintained in connection with G.M. engineering and product development process, internal investigation, and products liability claims).

94. *See id.* at 282–83 (describing Product Resolution Tracking System).

95. *See* VALUKAS REPORT, *supra* note 19*,* at 286 (describing Vehicle and Process Integration Review).

96. *See id.* at 289–90 (describing Field Performance Evaluation and Product Investigation processes).

97. *See* Peter J. Henning, *How G.M.'s Lawyers Failed in Their Duties*, N.Y. TIMES, June 9, 2014.

Several members of the company's in-house legal department were fired for failing to act with a sufficient sense of urgency.[98] The internal investigation found, however, that attorneys familiar with products liability cases pending against GM asked why the company had not ordered a recall and were told that the engineering department was "'acutely aware'" of the issue and was doing everything they could.[99] Nevertheless, CEO Barra faulted them for not doing more. Perhaps this is my parochial perspective as a former products liability lawyer, but this seems to be asking quite a bit of lawyers when, as the investigation determined, information about the nature of the problem and the company's response was diffused throughout the company, among engineers, customer-service specialists, managers, and lawyers.[100] In hindsight some documents, such as a report by the Wisconsin State Patrol and an Indiana University study appeared to be the proverbial smoking guns. Similarly, the House Committee investigating the 737-MAX crashes found internal Boeing documents expressing concern about the aggressive operation of the redesigned MCAS and the possibility that flight crews may not react quickly enough to an inadvertent operation. But an assessment of responsibility has to take into account what an actor actually knew at the time, not what is apparent only in hindsight. Like Boeing, GM paid a significant financial and reputational penalty as a result of the original defect in the ignition switches and its less-than-energetic response.[101] The normative question in both of these cases is whether defects in organizational cultures satisfy the common law and constitutional standards for the imposition of punitive damages.

V. Reprehensibility and Punitive Damages.

It is generally agreed that punitive damages are aimed at two goals that are familiar from the theory of punishment more generally, namely deterrence and retribution.[102] On the issue of deterrence, one

98. *See* Sue Reisinger, *GM In-house Lawyers "Removed" in Ignition-Switch Purge*, Corp. Couns. (June 9, 2014), https://www.law.com/corpcounsel/almID/1202658428467/.

99. *See* Valukas Report, *supra* note 19, at 184.

100. *See id.* at 143.

101. *See* Tom Krisher, *GM Ignition Switch Fund Pays out $594.5 Million*, L.A. Times, Dec. 10, 2015 (reporting that the recalls cost GM $5.3 billion, and that the company paid an additional $1.6 billion in criminal fines and civil settlements).

102. Dan Markel, *Retributive Damages: A Theory of Punitive Damages as Intermediate Sanction*, 94 Cornell L. Rev. 239, 241–42 (2009); Mark A. Geistfeld, *Punitive Damages, Retribution, and Due Process*, 81 S. Cal. L. Rev. 263, 269 (2008); Anthony J. Sebok, *Punitive Damages: From Myth to Theory*, 92 Iowa L. Rev. 957, 1004 (2007); A. Mitchell Polinsky & Steven Shavell, *Punitive Damages: An Economic Analysis*, 111 Harv. L. Rev. 869, 877 (1998); David F. Parlett, *Punitive Damages: Legal Hot Zones*, 56 La. L. Rev. 781, 792 (1995); David G. Owen, *The Moral*

could consider whether punitive damages would be required to deter misconduct such as that underlying the 737-MAX design and certification process. Economic analysis suggests that punitive damages should be assessed in the amount that represents the loss caused by the defendant's misconduct, no more or less.[103] Optimal deterrence would support the imposition of punitive damages in cases where wrongdoing is unlikely to be discovered.[104] Commercial aviation accidents are extremely high-profile events and are exhaustively investigated; other than the missing Malaysia Airlines Flight 370, I cannot think of a recent airline accident anywhere in the world where the precise cause was not eventually determined. From the *ex ante* decisionmaking point of view, Boeing managers and engineers would therefore have taken account of detection and the imposition of significant compensatory damages if some aspect of their aircraft's design caused an accident. Was an even bigger threat needed to prevent what occurred here? We'll return to that question toward the end of this section; I think it is hard to know what would be required to prevent a complex organizational dysfunction driven by the sorts of behavioral factors considered in the previous section. In any event, the emphasis in doctrinal law on reprehensibility may be difficult to square with a methodologically pure economic approach, focused on optimal deterrence.[105] There are also substantial normative arguments against deterrence as the theoretical foundation for punitive damages.[106] Accordingly, this analysis will focus on the issue of what counts as reprehensible behavior under common law punitive damages standards and the Supreme Court's due process jurisprudence.

The Second Restatement states that punitive damages are available only for "conduct involving some element of outrage similar to that usually found in crime."[107] The degree of reprehensibility of the defendant's conduct is also one of the primary considerations under the Supreme Court's constitutional framework for evaluating the permis-

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Foundations of Punitive Damages, 40 ALA. L. REV. 705, 705 (1989); Richard C. Ausness, *Retribution and Deterrence: The Role of Punitive Damages in Products Liability Litigation*, 74 KY. L. J. 1, 39, 70 (1985); Gary T. Schwartz, *Deterrence and Punishment in the Common Law of Punitive Damages: A Comment*, 56 S. CAL. L. REV. 133, 134–35 (1982); *see also* Dorsey D. Ellis, Jr., *Fairness and Efficiency in the Law of Punitive Damages*, 56 S. CAL. L. REV. 1, 3, 39, 43 (1982) (offering additional rationales).

103. Polinsky & Shavell, *supra* note 103, at 873–74; Robert D. Cooter, *Punitive Damages for Deterrence: When and How Much?*, 40 ALA. L. REV. 1143, 1148 (1989).

104. Mathias v. Accor Econ. Lodging, Inc., 347 F. 3d 672, 677 (7th Cir. 2003).

105. Polinsky & Shavell, *supra* note 103, at 875.

106. ANTHONY J. SEBOK, NORMATIVE THEORIES OF PUNITIVE DAMAGES: THE CASE OF DETERRENCE, *in* PHILOSOPHICAL FOUNDATIONS OF THE LAW OF TORTS (John Oberdiek ed. 2014).

107. RESTATEMENT (SECOND) OF TORTS § 908, cmt. b (AM. L. INST. 1979).

sibility of punitive damages.[108] The Court in *BMW v. Gore* said that "[p]erhaps the most important indicium of the reasonableness of a punitive damages award is the degree of reprehensibility of the defendant's conduct."[109] The reprehensibility factor reflects the normative judgment that "some wrongs are more blameworthy than others."[110] In *Campbell* the Court set out five guidelines for assessing reprehensibility: (1) whether "the harm caused was physical, as opposed to economic"; (2) whether the conduct showed "indifference to or a reckless disregard of the health and safety of others"; (3) whether the victim was particularly vulnerable; (4) whether the conduct was repeated or a one-off occurrence; and (5) whether the harm "was the result of intentional malice, trickery, or deceit, or mere accident." Conduct need not be intentional or done with an "evil motive"; acts done with reckless indifference to the rights of others may also support an award of punitive damages.[111] The Court's theory in these cases is that reprehensibility must be one of the prerequisites for the imposition of punitive damages, to ensure that there is a rational relationship between the amount of punitive damages and the nature of the defendant's misconduct. Considerations of legality, including the values of consistency and predictability, require that reprehensibility be one of the principal factors taken into account by courts in assessing punitive damages.[112]

One of the Supreme Court's recent constitutional cases involves a high-profile disaster causing extensive harm—the 1989 grounding of the crude oil tanker *Exxon Valdez*, captained by Joseph Hazelwood, a relapsed alcoholic, in Prince William Sound, Alaska, and the consequent spill of eleven million gallons of oil.[113] The Court provided a lengthy treatise on the history and theory of punitive damages, but said little about reprehensibility. However, multiple opinions by the Ninth Circuit in the protracted litigation directly address this factor. One of that court's opinions succinctly summarizes the company's culpability: "There was . . . testimony that the highest executives in Exxon Shipping knew Hazelwood had an alcohol problem, knew he had been treated for it, and knew that he had fallen off the wagon and was

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108. *See* Exxon Shipping Co. v. Baker, 554 U.S. 471 (2008); State Farm Mut. Auto. Ins. Co. v. Campbell, 538 U.S. 408, 416 (2003); Cooper Indus., Inc. v. Leatherman Tool Grp., Inc., 532 U.S. 424, 432 (2001); BMW N. Am., Inc. v. Gore, 517 U.S. 559, 574 (1996); Dan B. Dobbs, The Law of Torts § 381 1063 (2000).

109. BMW N. Am., Inc. v. Gore, 517 U.S. 559, 575 (1996).

110. *Id.*

111. State Farm Mut. Auto. Ins. Co. v. Campbell, 538 U.S. 408, 416 (2003).

112. Exxon Shipping Co. v. Baker, 554 U.S. 471, 502–05 (2008).

113. *Id.* at 476–78.

drinking on board their ships and in waterfront bars."[114] Exxon suggested that it behaved admirably by not firing an employee who had sought treatment for his addiction, but the company knew that he had resumed drinking in violation of his treatment regimen.[115] Nevertheless, as the court stated in a subsequent opinion, it is not the case that Exxon "calculatingly and maliciously steered the ship into disaster."[116] For that reason, the court concluded that "a punitive damages award that corresponds with the highest degree of reprehensibility does not comport with due process when Exxon's conduct falls squarely in the middle of a fault continuum."[117] This judgment was based substantially upon the conclusion that "Exxon's conduct was not intended to cause an oil spill, but neither was allowing a relapsed alcoholic to command a supertanker 'mere accident.'"[118] Rather, Exxon acted recklessly by entrusting the command of the vessel to an officer it knew was incompetent.[119] "Exxon's knowing disregard of the interests of commercial fishermen, subsistence fishermen, fish processors, cannery workers, tenders, seafood brokers and others dependent on Prince William Sound for their livelihoods, cannot be regarded as merely accidental."[120] On the basis of these considerations, the Ninth Circuit concluded that Exxon's conduct is "in the higher realm of reprehensibility, but not in the highest realm."[121]

Recklessness is the conscious disregard of a substantial and unjustifiable risk.[122] As the Ninth Circuit rightly emphasizes, conduct short of maliciously and calculatingly steering a ship into a reef can be reprehensible. The argument for imposing punitive damages against Boeing would be that the company made a conscious decision to deceive the FAA or airline customers by hiding or misstating the existence of MCAS, combined with turning a blind eye to the risks of inadvertent MCAS operation (due to unreliable data from the single AOA sensor) and a delayed reaction by the flight crew that would render the temporary upset unrecoverable. However, if the story reconstructed in Section III, based on the House Transportation Committee Report and investigations by aviation journalists, is accurate, the *Exxon Valdez* case is distinguishable from the 737-MAX accidents. The orga-

114. In re Exxon Valdez, 270 F.3d 1215, 1223 (9th Cir. 2001) (Kleinfeld, J.).
115. *Id.* at 1238.
116. In re Exxon Valdez, 490 F.3d 1066, 1073 (9th Cir. 2007).
117. *Id.*
118. *Id.* at 1085.
119. *Id.* at 1086.
120. *Id.* at 1088.
121. *Id.* at 1089.
122. Model Penal Code § 2.02(2)(c).

nizational dysfunction that led to the introduction of a passenger airliner with serious design and information defects meant that all of the relevant decisionmakers lacked conscious awareness of the risk. There is no evidence indicating what the engineers who increased the control authority of MCAS or remoted the G-force trigger expected would be done by those in the company responsible for preparing the Flight Crew Operations Manual. Mark Forkner testified that when he recommended not informing the FAA about MCAS it was based on his assumption that it only activated at high airspeeds and behaved no differently from the STS on the 737NG. Reports by test pilots of the alarming behavior of the modified MCAS were determined—erroneously, as it turns out—to be due to errors in the flight simulator programming. Classifying the risk of inadvertent MCAS operation as potentially catastrophic was done without knowledge that some test pilots had taken as long as ten seconds to react to the pitch upset, by which time the nose-down attitude would likely be unrecoverable. It was not the same kind of reckless indifference as knowing Joseph Hazelwood had started drinking again and yet permitting him to remain in his role as captain of the *Exxon Valdez*.

One might argue that it is reckless for a company to maintain a chaotic process for making safety-critical decisions. When the Chief Project Engineer stated that none of the engineering departments reported directly to him,[123] the response might be that *that* is the problem. The *Challenger* and GM ignition switch cases suggest, however, that complex organizations are vulnerable to certain patterns of failure, including the amplification of errors and cascade effects that locked in the 53 degree launch criterion for the space shuttle and the siloing of information that delayed GM's recall of cars with faulty ignition switches.[124] A company that conducts business as usual without making efforts to root out these sources of dysfunction would likely be negligent, but the standard of conscious disregard requires more.

In the *Exxon Valdez* case, the Ninth Circuit considered the efforts expended by Exxon to mitigate the damage caused by the oil spill as part of its analysis of the reprehensibility of the company's conduct.[125] It therefore seems only fair to consider a company's post-accident conduct as an aggravating factor, where appropriate. If the theory of punitive damages against Boeing is a post-accident cover-up, it may be

123. HOUSE TRANSP. COMM. REP., *supra* note 6, at 22.

124. *See* SUNSTEIN & HASTIE, *supra* note 1, at 23–24, 36.

125. In re Exxon Valdez, 270 F.3d 1215, 1242 (9th Cir. 2001). On remand from the Supreme Court the Ninth Circuit reaffirmed its reliance on Exxon's mitigation efforts. In re Exxon Valdez, 490 F.3d 1066, 1084 (9th Cir. 2007).

on stronger ground, although care is needed to avoid considering ordinary litigation strategy as an example of reprehensible conduct. The factual analysis in this paper focused on the design and certification process, since that has been extensively investigated and reported upon, and also because the public anger sparked by media accounts and the *Downfall* documentary appears to be driven by those initial decisions, not Boeing's efforts to keep the aircraft in service after Lion Air 610. Admittedly, doubling down on the design decisions it had made previously starts to look reckless as the evidence piled up that MCAS really was a serious hazard to safe flight. Even one who accepts the SNAFU explanation for the series of mistakes made in the design and certification process may be less inclined toward leniency in light of Boeing's post-accident conduct. This might lead to punitive damages being awarded only in connection with the Ethiopian 302 accident. This would be an odd result, but justified in principle based on the conduct for which punitive damages would be imposed.

VI. Conclusion: Keeping the SNAFU Concept within Bounds.

This Article is not intended as a defense of Boeing, although I realize it may appear that way. To be clear, the 737-MAX was allowed to enter airline service with design and information defects that posed an unacceptable risk to passengers, resulting in two needless accidents and hundreds of deaths. Nothing said here should be taken to lessen the culpability of the company for the harm it caused or mitigate the well-deserved reputational penalty for losing sight of its formerly robust culture of engineering excellence. Nevertheless, seeing the root cause of the flaws in the airplane as something approaching malicious intent to harm not only misdescribes Boeing's conduct but also perpetuates a narrative about the causes of risky behavior that may inhibit effective regulation. As John Darley argues, the "bad apples" explanation deflects energy from comprehensive efforts at organizational redesign. The highly moralized effort to characterize Boeing's conduct as reprehensible, while certainly understandable as a strategy for plaintiffs' lawyers to pursue in the litigation, may cause observers to misunderstand what lies behind many disasters involving technologically complex products and corporate defendants. The discussions of the *Challenger* and GM ignition switch cases are included to support the argument that organizational SNAFUs, not conscious indifference to safety, are a common explanatory factor in many high-profile disasters. The persistence of organizational culture defects suggests that they are very difficult to rectify, even for suitably motivated corporate leadership. I tend to think high-ranking decisionmakers at Boeing, NASA and Thiokol, and General Motors were already quite keen to avoid the financial and reputational disasters experienced by their organizations. The marginal addition to deterrence accomplished by even a huge punitive damages award seems unlikely to make much of a difference.

If this is the case, then reform efforts should take into account the literature on the culture of high-reliability organizations.[126] Safety researcher and airline pilot Sidney Dekker argues, for example, that criminalization and other punitive approaches to accidents overlook the role of systemic failures.[127] This does not mean letting corporations off the hook for wrongdoing, but rather directing efforts at overhauling organizational cultures. Labeling dysfunctional cultures as reprehensible could interfere with this effort, by entrenching a malice- or indifference-based explanation that is not consistent with the facts. One who believes punitive damages are justified on retributivist ground should pause before imposing such liability on a corporation where well-intentioned people tried to do the right thing, but failed because of bureaucratic dysfunctions. On a deterrent approach, if bureaucratic dysfunction is the explanation for the failing, the case should be made that the threat of punitive damages would do more than the likelihood of a huge compensatory award and reputational harm to deter similar cases in the future.

There is a risk that I have cherry-picked three stories illustrating the SNAFU explanation and have omitted cases that are more plausibly characterized as involving conduct that would satisfy the common law and constitutional standard of reprehensibility. As suggested above, the Volkswagen scandal, involving intentional and repeated efforts to cheat on emissions tests in the U.S. almost certainly would qualify, at least if the underlying cause of action supported liability for punitive damages. The same would be true for the efforts of Enron managers to manipulate the company's financial statements. And, as discussed above, the Ninth Circuit concluded that the conduct of Exxon Ship-

126. Because I am an aviation nerd, and because this is a paper about the design of an aircraft and the culture at an aerospace company, I will mostly cite examples from that field, although Perrow's book is a classic and would be irresponsible to omit. *See, e.g.*, SIDNEY W. A. DEKKER, TEN QUESTIONS ABOUT HUMAN ERROR: A NEW VIEW OF HUMAN FACTORS AND SYSTEM SAFETY (2005); CHARLES PERROW, NORMAL ACCIDENTS: LIVING WITH HIGH-RISK TECHNOLOGIES (1984); Karlene H. Roberts et al., *Must Accidents Happen? Lessons from High-Reliability Organizations*, 15 ACAD. MGMT. EXEC. 70 (2001); Karl E. Weick & Karlene H. Roberts, *Collective Mind in Organizations: Heedful Interrelating on Flight Decks*, 38 ADMIN. SCI. Q. 357 (1993); Gene I. Rochlin et al., *The Self-Designing High-Reliability Organization: Aircraft Carrier Flight Operations at Sea*, 40 NAVAL WAR COLL. REV. 76 (1987).

127. SIDNEY DEKKER, JUST CULTURE: BALANCING SAFETY AND ACCOUNTABILITY (2007).

ping managers satisfied the reprehensibility standard even though no one set out deliberately to ground the *Exxon Valdez* on Bligh Reef in Prince William Sound. I do not know enough about the decisionmaking at Purdue Pharmaceuticals or other companies involved in the opioid crisis to reach a conclusion one way or the other about the reprehensibility of those corporations' conduct. But that is really the point: It is important not to infer from the seriousness of the wrongdoing to a conclusion that the explanation must be nefarious. Systems problems are pervasive and the "bad apples" explanation is the anomaly. The fragmented, decentralized, even chaotic decisionmaking environment at Boeing is not something to be admired, and arguably neither is its fixation on rushing a resigned 737 to market. But in my judgment it would be incorrect to view the 737-MAX debacle as ultimately rooted in the kinds of attitudes and conduct that justify the imposition of punitive damages.

That said, it is important not to let the invocation of organizational culture defects become a kind of "Get Out of Jail Free" card. It is conceivable that cultural failings can be assessed for the culpability of individuals within the organization, based on factors such as whether any of their acts or omissions foreseeably worsened the functioning of systems intended to foster safety or reliability.[128] This Article was mostly intended to provide an in-depth case study of the organizational decisionmaking that can be understood as the root cause of a disaster. The major theme was the possibility that not all terrible events are traceable to terrible human acts and intentions. The argument here should not be understood as suggesting that dysfunctional culture necessarily excuse wrongdoing, as a matter of criminal law, punitive damages, or any other regulatory response. There are gradations of reprehensibility and also degrees of SNAFU-ness. Deliberate indifference to a seriously dysfunctional culture may count as a species of reprehensible conduct. Understanding where any given case falls on this continuum requires a detailed exploration of the decisionmaking process that lies behind the more particular, proximate cause of the accident. This kind of approach shows that, notwithstanding the popular understanding of the 737-MAX crashes, Boeing's conduct

128. In her comments at the Symposium, Miriam Baer suggested an analogy with the "homicide ladder" in criminal law, in which levels of culpability, as represented by distinct offenses (first and second degree murder, manslaughter, etc.), are differentiated by the actor's aim, purpose, beliefs, attitudes, and awareness of the possible consequences; partial defenses bearing on blameworthiness, such as duress and diminished responsibility; and the role of background risks and luck. *See* Victor Tadros, *The Homicide Ladder*, 69 MOD. L. REV. 601, 601, 603 (2006). This is a very useful analogy and close to what I have in mind here.

does not exhibit the kind of reprehensibility that is required for the imposition of punitive damages.