Ethics: An Alternative Account of the Ford Pinto Case

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1. Introduction

1.1 Conventional account

The Ford Pinto case is today considered a classic example of corporate wrong-doing and is a mainstay of courses in engineering ethics, business ethics, philosophy, and the sociology of white-collar crime. The conventional account of the case goes something like this:

> In the mid-1960's, Ford decided to rush a new subcompact car, the Pinto, into production to meet the growing competition from foreign imports. Because development was hurried, little time was available to modify the design when crash tests revealed a serious design defect: to provide adequate trunk space, the gas tank had been located behind rather than on top or in front of the rear axle. As a result, the Pinto was highly vulnerable to lethal fires in rear-end collisions and was in fact a "fire trap" and a "death trap." Ford decided to ignore the defect anyway, because re-design would have delayed the entry of the car into the market and caused a potential loss of market share to competitors. As reports of fire-related deaths in Pintos began to come in from the field and as further crash tests re-affirmed the danger of the fuel-tank design, Ford decision-makers made an informed and deliberate decision not to modify the design, because doing so would harm corporate profits. Ford's decision was based on the results of a cost-benefit analysis contained in the notorious "Pinto Memo," written by Ford engineers to guide design decisions. Incredibly, the analysis put a price tag on human life—$200,000— and then used that number to compare Ford's projected cost of settling burn-victim's lawsuits versus Ford's cost of spending $11 per car to fix the fuel tank defect. The conclusion was that spending $11 per car was not justified, even though conservative estimates showed that the un-modified design caused at least five hundred fire-related deaths in rear-end collisions, over an eight year period. Other internal Ford documents became public in which Ford employees recommended delaying implementation of safety features because of costs, even though many customers would die in accidents as a result. Eventually, public outcry forced the government to order Ford to recall the Pinto and fix the problem.

1.2 Factual support examined

In the present paper, the factual support for the conventional account is examined. Questions about the placement and design of the fuel tank are addressed, and a key table comparing Pinto accident-fatality rates to those of similar cars is given. This table—drawn from public government data—is almost never reproduced in publications by Pinto critics. The discussion is then rounded out by comments on various other criticisms that have been leveled at the Pinto.

The paper draws on many sources but most heavily on 1) an article by the late Gary Schwartz [1], a former law professor well-known in the legal profession as a leading scholar of tort law (his Pinto article has been cited as a “staple of the literature” [2]), and 2) a publication by Matthew Lee and David Ermann [3], professors of sociology. Unlike many people writing about the Pinto case, Schwartz, Lee and Ermann carefully examined the factual claims of the conventional account. They read trial transcripts, NHSTA documents, and related books, newspapers, and magazine articles. They interviewed NHSTA managers and engineers, Ford executives and engineers—including harsh critics and whistleblowers who had publicly criticized Ford—plaintiffs and defense attorneys, and safety consultants. They found that, in Schwartz’ rather dry description, “several significant factual misconceptions surround the public's understanding of the case.” The purpose of the present paper is to describe the Pinto case and point out commonly held factual misconceptions, so that the reader can make an informed judgment about the accuracy of the conventional account of the Pinto case.

2. History of the Pinto

2.1 Industry views on auto safety

The decisions that led to the Pinto design cannot be understood without taking into account the auto industry’s view of vehicle safety in the 1960s. Four aspects of that view stand out. First was the belief, promoted by the industry for decades prior to the 1960s, that traffic fatalities were caused by bad drivers and poor roads, not by unsafe cars. Car makers’ safety obligation was limited to ensuring that cars were safe during “normal operation”—for example, steering and braking systems must be reliable—but cars were not expected to survive accident conditions.

A second—and related—aspect of the industry’s view was that the legal requirements for car makers consisted of designing cars for normal use but not for crashworthiness. For example, car makers were liable for injuries suffered if a wheel fell off during a routine drive but were not liable if the driver hit a tree because of carelessness. A federal court opinion put it succinctly:

> The intended purpose of an automobile does not include its participation in collisions with other objects, despite the manufacturer's ability to foresee the possibility that such collisions may occur … the defendant also knows that its automobiles may be driven into bodies of water, but it is not suggested that the defendant has a duty to equip them with pontoons [4].

This opinion was written in 1966; it soon became obsolete because of the passage of the Motor Vehicle Safety Act (MVSA) of 1966 and because of an appellate court decision that radically changed product-liability law [5, p, 237]. The court held that it is entirely foreseeable that some passengers will be injured in car accidents, because “somewhere between one-third and three-fourths of all automobiles are involved in accidents.” But if the possibility of an injury is foreseeable, the court reasoned, then car makers could be held liable for selling an “unreasonably dangerous product” that did not prevent that injury during a crash. Determining if a product is unreasonably dangerous is usually left to a jury to decide, and while no jury has thus far cited a lack of pontoons as evidence of an unreasonably dangerous automobile, some strange cases have been sent to the jury: the Supreme Court of New York once decided that a jury should determine if a school bus could have been better designed to minimize the injuries and deaths that occurred when a 40,000-ton freight train struck the bus [5, p.239]. Crashworthiness was now a clear design objective of automakers, but designing for surviving a collision with a train would be challenging, to say the least.

A third aspect of the industry’s view of safety was that lower levels of safety were acceptable for smaller and cheaper cars compared to larger, more expensive cars. Accordingly, safety devices for small cars were offered as optional rather than standard equipment. Triumph Motors even complained to the National Highway Transportation Administration (NHTSA) in 1974 that its proposed standard for preventing fuel-tank fires during crashes would “discriminate against small vehicles,” because they were more vulnerable than large cars—that is, small vehicles’ vulnerability was assumed to be an intrinsic part of their nature.

A fourth aspect of the industry’s view of safety derived from Ford’s failed attempt in 1956 to sell cars by emphasizing safety rather than using the customary appeal to styling [6]. Sales of the safety package initially were strong but then dropped significantly, and Ford cancelled its safety-campaign advertising halfway through the year. “Safety doesn’t sell” became auto-industry conventional wisdom. In a curious twist of events, Lee Iacocca, Ford’s president from 1970 to 1978, was recorded on a Watergate tape in 1971 propounding the “safety doesn’t sell” belief to President Nixon: “So I’m in a position to be saying to Toms and Volpe [Department of Transportation officials], ‘Would you guys cool it a little bit? You’re gonna break us.’ And they say, ‘Hold it. People want safety.’ I say, ‘Well, then, what do you mean they want safety? We get letters … We get about thousands [of letters] on customer service. We can’t get your car fixed. We don’t get anything on safety! So again, give us a priority’” [7, p. 269].

Passage of the MVSA presented a new challenge to auto engineers. Designing for “normal operations” was no longer sufficient. Crashworthiness now had to be considered as well, and engineers both in the automotive industry and in NHTSA would find out that they had a lot to learn.

2.2 Development of the Pinto design

In the 1960s, Volkswagen and Toyota became very successful in selling their subcompact models in the automobile market in Europe and Japan. As interest in these vehicles increased in the United States, Ford and General Motors responded initially with their own subcompacts, the Ford Falcon and the Chevrolet Corvair, and planned to introduce new models in a few years—the Chevrolet Vega and Ford Pinto. Ford felt the need to get the Pinto ready as soon as possible, to avoid loss of market share. Thus Iacocca created a specialized team of engineers dedicated to Pinto design, and required them to accelerate the design-to-production cycle. Design began in June, 1967, and production of the first car began on August 10, 1970—a development time of 38 months, 5 months less than the 43 months that was the average development time of that era.

The design team was subjected to the additional pressure of having to meet Iacocca's "limits of 2000"—the weight and cost of the Pinto could not exceed 2000 pounds and $2000. An indication of the intense competition that existed in the subcompact market at the time is that even with the limits of 2000 in place, the Pinto would still be heavier and more expensive than some of the imported subcompacts. Thus Ford's competitors faced similar constraints in balancing safety and cost in design.

2.3 NHTSA and fuel-system integrity standards

In 1967, NHTSA issued Federal Motor Vehicle Safety Standard 301, which governed all fuel-system integrity issues. The initial version of the standard covered front-end collisions only, but in January, 1969, after the Pinto had been in development for about 18 months, NHTSA proposed expanding Standard 301 to cover fuel system integrity during *rear-end* collisions. (Generally NHTSA would propose a standard and then invite comments from all interested parties. Based on the comments, NHTSA would either issue the standard, possibly modified, or drop it from further consideration.) The rear-impact standard prescribed a test consisting of towing a 4,000-pound flat barrier at 20 mph and causing it to collide with the rear of a stationary car. Ford publically stated its approval of this "20-mph moving-barrier" test standard and used it to test four cars that had been modified to approximate the design of the Pinto rear end—Pintos were not available for testing because they had not yet been manufactured. Based on the test results, Ford modified the design of the Pinto fuel tank and, despite the accelerated development schedule, was able to introduce these modifications in the first Pintos manufactured.

NHTSA decided not to adopt the 20-mph moving-barrier standard. Instead, in August, 1970, it proposed a 20-mph *fixed-barrier* standard, which all vehicles were to meet within 18 months. "Fixed-barrier" meant that the vehicle was moving (towed backwards) into a stationary barrier. NHTSA also announced its long-term goal of moving to a 30-mph fixed-barrier standard. The 20-mph fixed-barrier standard was greeted with uniform opposition from the auto industry because it was a much more severe test than the moving barrier-standard.

Because of the difficulties with the fixed-barrier standard, Ford thought it improbable that NHTSA would revise Standard 301 to include fixed-barrier testing. Ford decided to continue working on ways to meet the 20-mph *moving*-barrier standard and also the 30-mph moving-barrier standard, which Ford thought that NHTSA would eventually implement. In November, 1971, Ford voluntarily adopted a 20-mph moving-barrier standard for all its cars, beginning with the 1973 model year; it was the only auto maker to do so [3].

2.4 Pinto Memo

In August, 1973, NHTSA proposed revising Standard 301 to include a 30-mph *moving*-barrier rear-end impact standard and a standard related to vehicle rollovers. Ford *accepted the collision standard* but strenuously opposed the rollover standard. In response to the proposed rollover standard, Ford submitted to FHTSA “A Petition for Reconsideration of Federal Motor Vehicle Safety Standard No. 301.” Attached to the petition document was what came to be known as the Pinto Memo, actually a report entitled “Fatalities Associated With Crash Induced Fuel Leakage and Fires,” written by Ford employees Earnest Grush and Carol Saunby, who were—contrary to the conventional account—not engineers. The report is also known as the “Grush/Saunby report” [8]. The final lines in the report stated that “The analysis discussed above concerns only rollover consequences and costs. Similar analysis for other impact modes would be expected to yield comparable results, with the implementation costs far outweighing the expected benefits.” Thus even though the report discussed rollover accidents—which were not part of the criticism of the Pinto design—rear-end collisions would be expected to have costs outweighing benefits, too.

The Pinto Memo “analysis” referred to above is a cost-benefit analysis intending to compare the costs and benefits associated with a design change. This analysis, which is given in Section 4 below, is one of the key reasons why the Ford Pinto case has become notorious as the epitome of cold, calculating, unethical decision-making in exchanging lives for corporate profits. Because the analysis has achieved such iconic status, it is important to clarify its purpose, actual use, and significance in Ford’s decision-making. The following conclusions are reported by Lee and Ermann [3],

The cost-benefit analysis described in the Pinto Memo

1. was intended to influence regulators at NHSTA.
2. was not intended for internal consumption at Ford.

3. was never provided to Ford design engineers or to Ford personnel who handled vehicle-recall issues.
4. was unknown to Ford employees responsible for technical design and safety decisions until a *Mother Jones* magazine article (described below) appeared in September, 1977.
5. could not have affected design decisions because the Pinto was designed in 1967-1970, but the Memo was written in 1973.
6. did not specifically deal with the Pinto and never even mentioned the Pinto.
7. was about all 12.5 million new American cars and light trucks sold annually by all companies in the United States. (The total cost was to be borne not just by Ford but by all auto manufacturers).
8. did not estimate that Ford's *lawsuit cost* would be $200,000 per death.

Taken as a whole, the facts about the Pinto Memo described above show that the significance and use of the document have been grossly misrepresented in the conventional account. Schwarz summarizes [1, p. 1026]:

> To sum up, the Ford document has been assigned an operational significance that it never possessed, and has been condemned as unethical on account of characterizations of the document that are in significant part unwarranted.

2.5 Grimshaw

On May 28, 1972, Lily Gray was driving her 1972 Ford Pinto hatchback on a California freeway when the car suddenly stalled and coasted to a halt in the middle lane. The car was struck from behind by another vehicle, and the Pinto fuel tank ruptured and leaked fuel, which led to a fire engulfing the car interior in flames. Mrs. Gray later died in the hospital and her 13-year old passenger, Richard Grimshaw, suffered horrible burns requiring over 90 surgeries and leaving him permanently disfigured. The families sued Ford, and in February, 1978, a jury awarded Grimshaw $2,516,000 in compensatory damages and $125 million in punitive damages; the heirs of Mrs. Gray were awarded $559,680 in compensatory damages. The $125 million punitive damages jury award was the highest for a product liability suit in American history up to that time and drew media attention to the Pinto and its fuel system. The trial judge, however, reduced the $125 million punitive damages to $3.5 million, stating that the latter amount was "fair and reasonable" [9]. During the trial, the plaintiff's attorneys attempted to introduce the Pinto Memo as evidence showing Ford's corporate mentality—but not as evidence relevant to the claim of liability, since the memo was concerned with rollovers, rather than rear-end collisions. However, the judge ruled against admissibility, an action that undercuts the later claimed significance of the document. The attempt to introduce the Memo as evidence and the judge's refusal were not widely known at the time and are not widely known to the present day.

Two important witnesses for the plaintiffs were Byron Bloch and Harley Copp. Bloch was a private consultant on auto safety design, a highly vocal and frequent critic of the auto industry, and had testified on behalf of plaintiffs in dozens of lawsuits alleging faults in fuel-system designs [10, p. 143]. Harley Copp was a former Ford executive with an impressive list of achievements during a long career with the company [10, p. 34]. In December, 1976, at age 55, Copp was forced to retire from Ford because his "extensive and unauthorized absences" kept him from carrying out his duties "in a satisfactory manner." Copp supporters believed that he had been forced out because he had pushed too hard for auto safety, [9; 10, p. 35] and he had become an irritant to management. While still at Ford, Copp had been giving talks to plaintiffs' lawyers on "The Secret of Obtaining Corporate Secrets," an activity that might have contributed to management's irritation [10, p. 164].

After leaving Ford, Copp served as a consultant and expert witness to plaintiffs in auto product-liability cases. He testified for two weeks in the Grimshaw trial, and the jury, apparently viewing him as "an outspoken Ford safety whistle-blower," rather than as "a disgruntled forcibly retired former employee," found his testimony convincing. As one juror later said, "The Pinto was a lousy and unsafe product."

The trial verdict was appealed, and in May, 1981, a California appellate court affirmed the jury's verdict and the trial judge's $3.5 million punitive damage award. [9] The court did not mince words:

> "[Ford] decided to defer correction of the [Pinto's] shortcomings by engaging in a cost-benefit analysis balancing human lives and limbs against corporate profits.

> Ford's institutional mentality was shown to be one of callous indifference to public safety. There was substantial evidence that Ford's conduct constituted ‘conscious disregard’ of the probability of injury to members of the consuming public. …
>
> [T]he conduct of Ford's management was reprehensible in the extreme. It exhibited a conscious and callous disregard of public safety in order to maximize corporate profits.”

Schwartz warns that standard legal practice calls for the appellate court’s opinion to “be treated cautiously as a source of actual facts. Because the defendant was appealing a jury verdict in favor of the plaintiffs, the court was under an obligation to view all the evidence in a way most favorable to the plaintiffs and essentially to ignore evidence in the record that might be favorable to the defendant” [1, p. 1016].

2.6 *Mother Jones* article

About the time that the Grimshaw trial began, *Mother Jones* magazine held a press conference in which Ralph Nader and author Mark Dowie announced an article entitled "Pinto Madness" [7] forthcoming in the September/October 1977 issue. They believed that the article would stir a large public outcry, because it revealed serious wrong-doing by Ford with respect to the Pinto fuel-system design. Harley Copp [1, p. 1027] was a major source of information for the story, and Byron Bloch was quoted several times. Dowie described the Pinto as a "fire-trap" and a "death-trap" and wondered “how long the Ford Motor Company would continue to market lethal cars were [Ford Chairman] Henry Ford II and Lee Iacocca serving 20-year terms in Leavenworth for consumer homicide.” Dowie stated that "By conservative estimates Pinto crashes have caused 500 burn deaths to people who would not have been seriously injured if the car had not burst into flames." He gave no source for the estimate.

The *Mother Jones* article encouraged consumers to write to NHTSA and demand a recall of earlier Pintos. The article even contained a "coupon" for readers to clip out and mail to NHTSA [1, p. 1019].

Dowie was awarded a Pulitzer Prize for his article. Sometime after the article appeared, a *60-Minutes* television episode was broadcast in which correspondent Mike Wallace accused Ford of reasoning that “we'll buy 2,000 deaths, 10,000 injuries because we want to make some money …" [3].

2.7 Recall

Dowie had accused NHTSA of yielding to auto-industry influence, and the allegations made in the *Mother Jones* article had brought NHTSA “an enormous flood of mail from consumers demanding that it do so something about the Pinto” [11]. Thus NSHTSA was under considerable pressure to act and knew that its actions would be closely followed in the media. NHTSA decided to launch a formal “defect investigation case” on September 13, 1977, [7, p. 79] despite having concluded in 1974 that the Pinto had “no recallable” problem [3, 13] and despite the fact that the car satisfied all applicable federal standards.

Part of the investigation consisted of setting up crash tests comparing the Pinto with the Chevrolet Vega (the Vega was included because it, along with the Gremlin, was often considered as having the least safe gas tank of the other American subcompacts.) Instead of using the 30-mph moving-barrier test that was NHTSA’s current standard, NHTSA engineer Lee Strickland and his group made up special testing conditions that would represent “real-world worst-case circumstances” [3].

Rather than a flat moving barrier, a large and especially rigid car (a 1971 Chevrolet Impala) was selected to crash into the (stationary) test-car’s rear end. To ensure good contact with the gas tank, the nose of the Impala was loaded with weights so that it would slide under the test car. To provide an ignition source for a fire, the headlights of the impacting car and brake lights of the stationary car were left on, and the engines of both the moving and stationary vehicles were warmed up and running; tanks in both the moving and test cars were filled with gasoline rather than the non-flammable mineral spirits usually used in crash tests [3; 6, p. 88].

Eleven crash tests of 1971-1976 Pintos were staged [7, p.94-95], with collision speeds varying between 30 and 35 mph.   Two of the Pintos tested at 35 mph caught fire and two of them tested at the same speed did not (but leaked fuel copiously). The five Vegas tested generally leaked much smaller amounts than the Pintos at all speeds, and no Vega caught fire.

Ford management was outraged by the study and thought it to be “unfair and inappropriate” [11], presumably because the “real-world worst-case circumstances” were so unlikely to actually occur in the real world that the test was useless except as a public-relations ploy—indeed, NHTSA’s own report mentioned that “efforts were expended in cooperating with the media and consumer groups to advise them of the nature, scope, and status of the NHTSA’s investigation” [7, p.89]. Most other subcompacts of the 1970s would have failed the 35-mph impact used in the tests, but NHTSA neither tested them nor recalled them. The makers of these other subcompacts were able to deflect criticism by claiming that their cars represented “acceptable risks” [3]. Years later, when Strickland was asked about the difference in treatment of the Pinto compared to the other subcompacts, he stated, "Just because your friends get away with shoplifting, doesn't mean you should get away with it too" [3].

Based on the test results, NHTSA declared that the Pinto gas tank was a safety defect. Ford then agreed to “voluntarily” recall all 1971-1976 Pintos—the largest automobile recall campaign ever up to that time. Ford stated that it could have successfully fought a compulsory recall order but decided to comply because of the extensive bad publicity it was receiving. The recall consisted of inserting plastic shields near the fuel tank and changing the filler pipe (the pipe running from the fuel tank to the gas cap) design—modifications corresponding to the design changes already implemented for the 1977 model year.

2.8 The Indiana Trial

Another major legal case involving Ford arose in 1978 in northern Indiana. [12, 13] Three teenage girls traveling in a 1973 Pinto stopped to retrieve the car’s gas cap, which had been inadvertently placed on top of the car during an earlier stop for gas and which had now fallen off and lay in the road. The driver stopped in a traffic lane because there was no shoulder available—in fact, a local citizens’ safety committee had previously written to the Indiana Highway Department requesting that a breakdown lane be provided for just such emergencies. The Pinto was then struck in the rear by a van traveling at fifty mph whose driver was looking down at the floor to locate a cigarette he had dropped [10, p. 132]. The Pinto burst into flames and the two passengers died at the scene. The Pinto driver died later in the hospital. The state prosecutor charged Ford with criminal recklessness and reckless homicide—an action welcomed as "a precedent-setting event in American jurisprudence" by those studying white-collar crime, because it was the first time that a corporation had ever been charged with a *criminal offense* in a product-liability case [14, p. 163]. Because Indiana's reckless homicide law had been passed recently—in 1977—the prosecution was limited to showing that Ford had failed in repairing or warning about defects since 1977; Ford's *initial* design of the Pinto was not an issue, and the prosecutor, to his great frustration, was not able to introduce into evidence Ford's internal documents, which he considered highly incriminating. In March, 1980, the jury pronounced Ford not guilty. It is important to emphasize that the "not guilty" verdict referred only to Ford's failure to warn, not to Ford's possibly having designed a defective and dangerous product, as the latter was not the issue in the case.

3. Safety of the Pinto

3.1 Definition of "Safe"

A widespread view among the public is that "safe" is a binary property: something is either safe or unsafe—there is no state or condition in between. For example, expressions such as "the risk of injury or death must be zero," and "failure is not a possibility" are commonly heard and are all based on the assumption that the probability of failure can be reduced to zero—that is, a "safe" condition can be achieved in the absolute, or binary sense. Many of these ideas are easily refuted. For instance, if the risk of injury or death must be zero, no rational person would ever eat an apple, since the risk of death is non-zero—in the United States the odds of choking to death on food are 1 out of 4,404 in a given year [15].

A more realistic definition of "safe" is needed. William Lowrance, in his book *Of Acceptable Risk*, suggests [16, p. 8],

> "A thing is safe if its risks are judged to be acceptable."

He then defines risk as “the probability and severity of harm to human health.” Thus the risk associated with an event can be represented as a point on a line measuring probability values from zero to one, and something is called safe or unsafe, depending on someone’s subjective judgment of where the ”acceptable” region lies on the line. But these definitions bring out a key distinction. Risk can be estimated by specialists knowledgeable in the relevant technical area, for example, automotive engineers specializing in crashworthiness. On the other hand, s*afety is determined by a subjective judgment about how much risk is acceptable.*

Events in Oregon in April, 1978, provide a striking example of how people make different judgments about what constitutes acceptable risk [17]. Two months earlier, the verdict in the Grimshaw case had been announced. As a result, several governmental agencies in Oregon became concerned about safety and liability issues and decided to sell all their 1971-1976 Pintos. Aside from the questionable ethical and legal behavior of a governmental agency selling to the public vehicles which it considered unsafe—*destroying* the cars would have seemed a better way to promote safety and avoid liability—selling the Pintos led to an interesting result. An Oregon auto dealer who took 65 Pintos from the Multnomah County government as trade-ins reported that “the cars, which are priced at $1,000 to $1,800 as is with no warranty or discount, have been selling at a faster pace than even he had expected.” Because the Grimshaw verdict had been publicized, the buyers likely were well-informed about potential safety problems with Pintos but judged them to be an acceptable risk, that is, they considered the cars to be “safe,” even though government officials did not.

3.2 A fundamental trade-off in automobile design

In the conventional account, Ford is faulted for trading off increased risk for decreased cost. But a huge trade-off between risk and cost underlines *all* automobile design, as consideration of an extreme example in which the trade-off is large and obvious will show.

Figure 1. Mobile Strike Force Vehicle Armored Personnel Carrier (Photo by Textron Marine and Land Systems)

A military personnel carrier is shown in Figure 1[18]. This vehicle protects passengers by means of large amounts of metal that surround the passenger compartment. But each carrier costs $1.1 million, and even after deducting the cost of military equipment such as weaponry, the carrier costs far too much to be purchased for civilian use.

To produce a vehicle that consumers can afford to buy, such as the typical passenger car shown in Figure 2, designers omit most of the metal that makes the carrier so safe. In doing so, they have made a huge trade-off between increased risk and decreased cost, and many of the 33,000 deaths per year in U.S. auto accidents are a result [19]. Many of the people who died would have survived if they had been riding in more ruggedly built vehicles—vehicles heavier than the typical passenger car of Figure 2 but not even taken to the extreme of the carrier. If asked about this trade-off, the designers probably would shrug and state that they have to “be practical,” or “give people what they want.” It is unlikely that critics would denounce the designers for “engaging in a cost-benefit analysis balancing human lives and limbs against corporate profits,” as the appellate court in the Grimshaw case accused Ford of doing, even though that is what typical car designers have implicitly done.

Figure 2. Honda Accord (photo by author)

Why does the public accept this trade-off? Because the public considers the typical passenger car to be an acceptable risk. Most members of the public do not know the actual odds of dying in a car accident—about 1 in 37,000 in a one-year period [20]—but nevertheless correctly judge that the risk to an individual is small. Given that the risk is acceptable and that other benefits beside lower cost are numerous—speed, comfort, convenience, fuel efficiency, appearance and lower cost, to name a few—the trade-off is readily accepted.

The implication of the above observations is that in automobile design, trading off risk and cost is a well-established and accepted practice. All auto designers, including Pinto engineers, implicitly make or have made a huge trade off in reducing protective metal so as to decrease costs. The only reasonable criticism of the Pinto engineers would be that the Pinto design trade-offs were done in such a way that the resulting vehicle was not "an acceptable risk." Most Pinto engineers thought that they had achieved the goal of designing an inexpensive car that was an acceptable risk. As will be mentioned in a later section, the engineers drove the car themselves. And "even Harley Copp, the outspoken Ford safety whistle-blower, never asserted that informed Ford [engineers] believed the [Pinto] was unsafe" [3].

3.3 Design of the fuel tank

3.3.1 Tank location

Locating the fuel tank behind the rear axle, rather than above or straddling the axle, has been the Pinto's single most-criticized design feature. The location of the tank was a major topic in the Indiana trial where many witnesses testified about it [10]. Among those testifying for the prosecution were Byron Bloch and Harley Copp, who have been mentioned previously in connection with the Grimshaw case and the *Mother Jones* article. Testifying for the defense were Harold MacDonald, the engineer in overall charge of Pinto's design, and various other Ford engineering executives and hired experts.

Bloch and Copp testified first. They argued against locating the tank behind the rear axle, because little crush space would exist between the tank and the front end of a vehicle colliding with the rear end of the Pinto. As a result, the Pinto would be especially vulnerable to fire—the impacting vehicle might crush the tank and cause it to leak fuel, which could then be ignited by a spark.

In contrast, defense witnesses in their testimonies listed a number of objections to positioning the tank in front of or straddling the axle:

- The chance of a fire *in the passenger compartment* might actually *increase*, since the leaking fuel would now be closer to the compartment. For example, locating the tank above or straddling the axle would make it more vulnerable to side impacts than locating it behind the axle. Unfortunately, side impacts are well over twice as common as rear-end impacts [21, p. 3-23] and thus the danger of fire in the passenger compartment may be increased. (In a strange coincidence, MacDonald's father had died in a fire when his Model A Ford burst into flames after a frontal collision with a tree. The fuel tank of the Model A had been in the front of the vehicle, close to the driver. The incident caused MacDonald to be "very sensitive about fuel tank placement" and to "feel very strongly it should be as far from the engine and passenger compartment as possible." He felt that the above-the-rear-axle placement was less safe under real-world conditions because the tank was closer to the passenger compartment and more likely to be punctured by items in the trunk" [10, p. 207]).

- Because the tank would be above the axle or above the drive shaft, it would be farther off the ground, and the center of mass of the vehicle would thus be higher. As a result, overall safety would be decreased because the vehicle's handling properties would be worse.
- Locating the tank over the axle would require a long, crooked filler pipe that would be more vulnerable to damage and thus fuel leakage in a collision.
- Trunk capacity would be greatly reduced.
- Servicing would be more difficult.
- A station wagon or hatchback version of the car could not be produced.
- Almost every American-made car at the time also had the fuel tank located behind the rear axle; it represented accepted American engineering practice of the era.

In addition to these observations, MacDonald criticized the idea of relying strongly on flat barrier testing to determine safety in rear-end collisions: "If you use the flat barrier as the sole criterion for positioning the fuel tank, then the over-the-axle location is safer. But there is a lot more involved than the barrier test" [10, p. 207]. When former NHTSA head, Douglas Toms, who was testifying for Ford, was asked about the appropriate location for the fuel tank in a car, he replied, "The fuel tank may be anywhere in the car. The important thing is how it performs, not where the tank was located" [10, p. 193].

3.3.2 Other questions about tank design

Critics such as Bloch and Copp pointed out many other tank-design characteristics, in addition to the location of the fuel tank, that they believed should be modified. One modification which is frequently cited as an option that Ford ignored, or, worse, suppressed so as to save money, was the use of a rubber bladder inside the tank. In fact, late in the design process—in 1971—a 30-page study, called the "Pricor Report," was produced by a junior Ford engineer, and one of its major recommendations was to use a rubber bladder. The idea was seriously considered, even though no other American car currently used a rubber bladder. The bladder performed well in a crash test but was ultimately found to be unsuitable: in cold weather it became very stiff and filling the tank became difficult, and in very hot weather, it failed under test conditions [11]. Tom Sneva, the expert-witness race-driver, testified in the Indiana case about the difficulties encountered in using rubber bladders in racing cars [10, p. 201].

3.3.3 Crash testing

Another topic on which Pinto critics have focused is Ford's purported lack of concern—or actual lying—about fuel leakage that occurred in rear-end crash tests conducted by the company. Lee and Ermann assess this purported lack of concern [3]:

> Commentators on the Pinto case (writing in a later era with different beliefs) assume that fuel tank leakage in rear end-crash tests must have alarmed both engineers and managers. They didn't [sic], because the tests were not sufficiently convincing at the time (or even today). Crash tests during that era were novel procedures. Both the auto industry and NHTSA were more concerned with the reliability and validity of the tests than with safety data generated by a particular car's tests. …
>
> Results that seemed "troubling" to later writers seemed less problematical at the time and were neutralized by participants' background assumptions about small cars and crashworthiness. …
>
> Nothing in this, or any other, Ford test report indicates that participants felt cause for concern or organizational action. Although some Ford engineers were not especially pleased, they felt that the data were inconclusive or the risks acceptable, or they kept their concerns to themselves. Some felt that cars would rarely be subjected to the extreme forces generated in a fixed-barrier test in real-world collisions.

An additional reason that Ford engineers were not especially concerned about fuel leaks during tests was that they thought that the crash-test results from experiments with other subcompacts, especially the imports, were much worse than Pinto's. The Ford engineers' view also derived from the contemporary industry view that small cars in general were necessarily less safe than large cars.

3.4 Ford engineers' opinions about Pinto safety

Based on reviewing various technical documents and on interviews with Ford personnel conducted in 1996 and 1997—almost thirty years after the Pinto was designed— Lee and Ermann came to a number of conclusions about Ford engineers' opinions about Pinto safety [3].

1) Ford engineers did not consider that they were "taking calculated risks with consumers' lives" [3]. They did not worry about potential lawsuits when deciding on design questions, and "they did not refuse to correct perceived problems because settling lawsuits would be cheaper."

2) Expressing a typical design engineer's preference for the devil you know to the devil you don't, engineers preferred the existing fuel-system design to the uncertainties of a new design.

3) There was no consensus among Ford engineers that the Pinto was unsafe. Among those engineers recognized for their genuine concern for safety, no consensus existed even about what were the potential problems. Windshield retention in a collision, fuel leakage in *frontal*-impact collisions, and lack of safety glass were considered by some engineers as more important problems than rear-impact collision protection. Lee is quoted in a 2015 article, as he looked back at the results of his interviews almost 20 years earlier: "They didn't see the fuel-tank issue as the central problem, and they didn't see the fix that was implemented as the result of the recall as doing anything worthwhile." They were aware of the facts of the Indiana trial and of the NHTSA review of the effectiveness of Standard 301 [21]. In their opinion, it was more important to focus on other safety concerns. "They would say things like 'the gas tank was problematic, as it was for all the other small cars and as it still is today for many small cars.' Then they would say, 'But the real issue is this'—and they would go off on a passionate discussion of safety glass" [22].

4) By convention, when communicating with non-engineers within the company, Ford engineers and managers formulated rationales expressed in financial terms ("corporate profits"). Within their own group, engineers and managers understood "acceptable risk" to be the key factor in decision making. When memos using financial rationales became public, as the result of litigation or in other ways, the practice of referring to "cost savings" and "company profits" in memos was used by critics to accuse Ford personnel of putting profits above safety.

5) Those engineers who were in the group in charge of initiating recalls and who had concerns about Pinto safety felt constrained because their concerns did not satisfy the established recall criteria. Similarly, engineers who initially worried about Pinto safety "believed themselves powerless to challenge prevailing 'acceptable risk' definitions. This self- censorship insulated higher-level officials from the various and de-centralized safety concerns (e.g., safety glass, windshield retention, fuel tank integrity) of people who were working on the Pinto. Lee Iacocca's perceived unapproachability also discouraged communication, so he heard mostly from employees like engineer Tom Feaheny who believed the car was safe."

In addition to the opinions of Ford engineers expressed in the Lee and Ermann interviews, the testimony at the Indiana trial revealed confidence in the Pinto's safety. Harold MacDonald testified that he drove a 1973 Pinto himself and had bought one for his son. Later, another Ford engineering executive testified that he drove a 1973 Pinto and had bought one for his son, who had owned it for two years. A third engineering executive testified that his wife drove a Pinto, and yet another engineering executive testified that he had worked on the production of the 1973 Pinto, and he gave one to his daughter, who at eighteen was the same age as one of the victims in the accident. The defense considered the testimony of these witnesses to be some of the most significant in the trial, because it showed that those Ford engineers who were well-informed about the design details considered the Pinto to be safe. The prosecution's response consisted of asking the witnesses to state their salaries and bonuses at Ford, which were based on Ford's profits.

3.5 Comparative fatality rates

If, as alleged in the conventional account, Ford irresponsibly traded decreased safety for increased corporate profits, then that trade should have shown up in a poor safety record for the Pinto. The effect of the Ford design decisions can thus be put to an empirical test—did field crash data show that the Pinto was more dangerous than its peers? Table 1 below shows the number of occupant fatalities per million subcompact cars in operation during the two-year period 1/1/1975 to 12/31/1976 [1, p. 1029]. Fatalities for only the 1975 and 1976 models were considered.

MODEL YEAR 1975		MODEL YEAR 1976	
CAR MODEL		**CAR MODEL**	
AMC Gremlin	274	Toyota Corolla	293
Chevrolet Vega	288	Chevrolet Vega	310
Datsun 510	294	AMC Gremlin	315
Ford Pinto	298	Ford Pinto	322
Toyota Corolla	333	Datsun 510	340
VW Beetle	378	VW Beetle	370
Datsun 1200/210	392	Datsun 1200/210	418
Average	322	Average	338

Table 1. Vehicles Ranked by Increasing Number of All-Cause Fatalities per Million Vehicles from 1/1/1975 to 12/31/1976

The Pinto ranks fourth and better than average in both model years. The data do not support the characterization of the Pinto as a firetrap, a death-trap, or a lethal car.

Critics of Pinto safety usually refer to fatalities caused by fires in rear-end collisions, rather than fatalities from all causes. A frequently cited finding is that for the time period 1971-1977, NHTSA identified thirty-eight rear-end collisions for Pintos that resulted in tank leakage or fire [23]. These collisions led to twenty-seven deaths (the same number of deaths allegedly caused by a Pinto transmission problem—for which no recall was issued [24]). Arguments exist for saying that the figure of twenty-seven is somewhat uncertain, [1, p. 1030] but what is certain is that the figure is nowhere near the 500 burn deaths claimed in the *Mother Jones* article.

Schwartz [1, p. 1033] studied the question of the Pinto's relative safety in rear-end collisions involving fire fatalities. By consulting several internal Ford documents—which were not favorable to the Pinto—and obtaining additional accident data from NHTSA, he concluded that "these various sources suggest that for rear-end fire [-fatality] purposes the early 1970s Pinto was better than the Gremlin, worse than the Vega, worse than the all-subcompact average, quite possibly worse than the Datsun 1200/210, and clearly worse than the Toyota Corolla."

But if the Pinto had a disproportionate share of deaths by fire in rear-end collisions, then why didn't it rank much worse in all-cause fatalities? The reason is that the number of rear-end collision-fire fatalities was so small as to have little effect on the all-cause fatality rate. According to Schwarz, "Only one percent of all traffic crashes result in fires; only four percent of all occupant fatalities occur in fire crashes; only 15% of all fatal fire crashes result from rear-end collisions" [1, p. 1029]. The high ranking in *all-cause* safety (Table 1) of the Gremlin, which had the worst ranking in *rear-end* fire-fatalities, supports the conclusion that rear-end fire-fatality collisions were rare.

Schwartz summarizes the issue of Pinto safety [1, p. 1066]:

> From what I have been able to learn, as for safety the Pinto was a car that was neither admirable nor despicable. Its overall fatality rate was roughly in the middle of the subcompact range; its record was better than the subcompact average with respect to fatalities-with-fire; yet for the quite small category of fatalities with rear-end-fire, its design features apparently gave it a worse than-average record.

4. Other criticisms of the Pinto

4.1 Cost-benefit analysis

In his Pinto Madness article published in *Mother Jones*, author Mark Dowie asked, "Why did Ford wait so long to make these minimal, inexpensive improvements [improvements that were eventually made to the fuel-tank system in 1977]? Ford waited eight years because its internal cost-benefit analysis, *which places a dollar value on human life,* [italics in the original] said it wasn't profitable to make the changes sooner." Dowie went on to state that cost-benefit analysis makes sense as a management tool, but that "serious problems" arise "when public officials … apply cost-benefit analysis to every conceivable decision. The inevitable result is that they must place a dollar value on human life." Furthermore, Ford had decided that the dollar value was (only) $200,000.

The analysis cited by Dowie was given in the Pinto Memo and is shown in Figure 3 below. In the table, the Unit Cost of $11 ($58 in 2015 prices) per car and truck was based on Ford's estimate of the cost of a safety valve to prevent fuel spillage in a rollover accident. The conclusion of the analysis is that the costs of installing the valve, $137 million, would far outweigh the benefits, $49.5 million, and thus the valve should not be installed, even though many deaths and injuries would have been prevented (recall that Grush and Saunby stated that their analysis would yield similar results for other accident types, such as rear-end collisions).

Benefits:
Savings –180 burn deaths, 180 serious burn injuries, 2100 burned vehicles.
Unit Cost – $200,000 per death, $67,000 per injury, $700 per vehicle.
Total Benefit – 180 × ($200,000) +180 × ($67,000) +2100x ($700) = <u>$49.5 million</u>

Costs:
Sales – 11 million cars, 1.5 million light trucks.
Unit Cost – $11 per car, $11 per truck.
Total Cost – 11,000,000 × ($11) +1,500,000 × ($11) - <u>$137 million</u>.

Figure 3. Benefits and Costs Relating to Fuel Leakage Associated with the Static Rollover Test Portion of FMVSS 208 (Occupant Crash Protection Standard). Grush/Saunby Report [8]

Dowie objected strenuously to this approach to safety and charged that Ford had acted unethically, even criminally, in daring to decide if a safety improvement was worth doing by comparing its cost to the monetary benefit of lives saved and in choosing a monetary value that was shockingly low.

These charges do not stand up under examination, as the following observations make clear.

1. As shown in Appendix A, many possible safety modifications exist. But implementing them *all* is impossible, because the resulting vehicle would be prohibitively expensive. Thus s*ome* method must be used to select which of them should be implemented. Cost-benefit analysis is the only widely accepted method available for the selection process.

2. In 1974, President Gerald Ford issued Executive Order 11,821 [3] requiring regulatory agencies to provide numerical estimates of the costs and benefits associated with any rules being propagated. Providing numerical estimates of benefits requires placing a monetary value on human life. Thus regulatory agencies at the time were required to do precisely what Dowie declared to be unethical.

3. Most federal agencies currently require that corporations seeking regulatory approval perform a cost-benefit analysis, and furthermore that the analysis be based on *agency-approved monetary values* for human life. Here are values approved by three agencies for use, as of 2011 [25]:

Environmental Protection Agency: $9.1 million
Food and Drug Administration: $7.9 million
Department of Transportation: $6 million

That the numbers are not the same for each agency has been attributed to the observation that politics trumps economics.

4. Grush and Saunby state that the $200,000 figure used in the analysis was NHTSA's (not Ford's) highest estimate of societal (not corporate) cost per death, and was taken from a NSHTA report [26]. But this justification for Ford's use of the $200,000 figure is not clear-cut because, according to Schwartz, "in its standard-setting NHTSA was not, in the early 1970's, relying on a $200,000 life-value figure. In setting standards, however, NHTSA was indeed taking both monetary costs and safety benefits into account; in doing so, the agency was essentially finessing the question of the monetary value of life, while at the same time releasing documents that set forth a $200,000 life-value datum." In light of such ambiguity, Ford's use of NHTSA's $200,000 figure appears reasonable [1, p. 1024].

4.2 Ford decision-making

The appellate court in the Grimshaw case accused Ford management of "conscious disregard" of public safety. However, Lee and Ermann point out the essentially unreflective nature of actions by Ford (and other auto makers at the time) in general:

> Finally, even our study probably imputes a greater degree of rationality to Pinto-related outcomes than existed. By focusing attention on one issue (e.g., Pinto safety), studies of organizational processes and institutional contexts like ours tend to imply the existence of "decisions." Despite our argument that a consciously cynical decision did not produce an

> unsafe fuel tank design, our description of the Pinto case probably implies an inflated level of rationality to what is better understood as institutionally embedded unreflective action. In fact, the Pinto design emerged from social forces both internal and external to Ford. There was no "decision" to market an unsafe product, and there was no "decision" to market a safe one.

In other words, there was no conspiracy; things just happened in the normal way a large technocratic bureaucracy proceeds.

5. Alternative account

This paper began with a statement of the conventional account of the Ford Pinto case. It is time now to give an alternative account. The statement given in the Indiana trial by former NSHTA head, Douglas Toms, summarizes the situation simply: the Pinto was "a very conventional automobile and was designed and constructed comparably with most other cars of its type at the time" [10, p. 192].

6. Appeal of the conventional account

The more one learns about the Pinto case, the more one wonders why so many people have accepted and continue to accept the conventional account. Lee and Ermann [3] speculate that its ready acceptance stems from the social movement against white-collar crime that arose after the Watergate scandals and continues to the present day. They go on to state that the conventional account "has been so widely promulgated because of its usefulness to journalists, business ethicists, sociologists, lawmakers, etc." In the Pinto case, two court cases were highly publicized, and the accusatory Pinto Madness article appeared, all strongly influenced by the assertions of a single former Ford executive. Then "confirmation bias"—the tendency to accept uncritically reports that confirm one's beliefs—took over to create a perfect white-collar crime story: top managers at Ford were criminals and acted unconscionably in their desire to increase corporate profits. No closer examination of the facts was needed. The story fit pre-existing beliefs about white-collar crime and corporations and that was enough.

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Appendix A

Additional Safety Features

Given below is a list of safety features known to Pinto designers but not implemented. An experienced automotive engineer specializing in crashworthiness could, given adequate time and an unconstrained budget, easily double the length of the list. Because including every conceivable safety feature would have led to a car too expensive for most consumers, Pinto designers and designers of competing subcompacts had to select which safety features to include and which to exclude, while knowing that excluding some of the features would produce a statistical certainty that some passengers would die as a result. This situation is unavoidable in a world of finite resources. The best that designers can do is create a car that is an acceptable risk.

Low-cost design changes advocated by Harley Copp [9]:

- Longitudinal side beams
- Cross beams
- Shock absorbing "flak suit" (protective material around fuel tank)
- Tank within a tank
- Placement of the tank over the rear axle
- Nylon bladder within the tank
- Placement of the tank over the rear axle with a protective barrier
- Use of a smooth differential housing with no protruding bolt heads
- Protective shield between differential housing and fuel tank
- Improvement and reinforcement of rear bumper
- Additional 8" crush space

Design changes later implemented by various manufacturers to meet 1977 fuel-leakage standard, as reported in the NHTSA 1990 report [21, p. 4-15]:

- Fuel tank:
  - Redesigned filler pipe
  - Heavier gauge metal

Recontoured to minimize contact/puncture by other adjacent vehicle components

Increased strength of solder/weld seams

Strengthened mounting of tank by adding brackets, revising mounting bolts, and increased torque of mounting straps

Strengthened filler cap seal

Recontoured fuel lines

Recontoured fuel evaporation control system, revised vapor lines and clamps

Inclusion of shield for fuel pump

Revised and added supports for rear floor pan/support/rails/wheel housing

Changed support brackets, revised mounting bolts, revised mounting procedure, and added shield for rear suspension (springs, shock absorbers)

Reduced risk of tank puncture by changing contour of lines, screw heads, mounting clips, and recontouring the vent cover of the rear axle assemble

Design changes that would have saved more lives but at higher cost:

Anti-lock brakes

Front disk brakes

Rear disk brakes

Braking system with stepped-bore master cylinder

Multistage impact-absorbing steering column

Strengthened roof supports

Airbags

Front, rear and side crumple zones

Safety cell—passenger compartment reinforced with high strength materials

Side-impact protection beams

Safety features present in race cars:

5-Point harness

Roll cage

Roll bar

Window net

Roll cage net

Crash helmet