Chapter 3

1978: Ford Pinto Recall

THE REPORTED STORY

The *New York Times* Abstract:

> After months of vigorously defending the safety of the fuel systems in its Pinto automobile, the Ford Motor Company today announced the recall of 1.5 million of the subcompacts for "modifications" of the fuel system aimed at increasing resistance to leakage and diminishing the risk of fire in the event of rear-end crashes. (Stuart, 1978)

THE BACK STORY

AUTOMOBILE SAFETY

When Henry Ford began to market the Model T, the first mass-produced automobile, in 1908, its design had no specific provisions for safety. Until 1955, safety door locks were not installed in any model, even though doors opened in 42% of all serious crashes until that time. In general, the public believed that the primary cause of accidents was improper driving. The entire safety establishment, which was heavily influenced by the auto industry, promoted the view that safety meant "safe behavior by drivers" (Dirksen, 1997).

The Ford Motor Company attempted to change this viewpoint in 1956, when it introduced its "Lifeguard Design." This new design involved equipping cars with a deep-dish steering wheel, padded seatbacks, swing-away rearview mirrors, safety door latches, safety belts, padded dashboards, and padded sun visors and rearview mirrors (Dirksen, 1997). The intent of these features was to minimize the effect of a driver colliding with the inside of his or her car during a crash. Unfortunately, General Motors (G.M.) Chevrolet's emphasis on new design and a more powerful V-8 engine led to more sales than Ford that year, leading many in the auto industry to conclude that "safety doesn't sell." Ford management responded by deemphasizing safety and focusing more on style and horsepower (Fielder, 1994).

Ralph Nader challenged this viewpoint in 1965 with the publication of his book *Unsafe At Any Speed.* He called attention to the structural defects in G.M.'s Corvair, which he believed (an investigation by the National Highway Traffic and Safety Administration proved otherwise) caused the car to become uncontrollable and overturn at high speeds. He also raised the question, Who is responsible for injuries and deaths due to auto accidents? Said Nader, "The prevailing view of traffic safety is much more a political strategy to defend special interests than it is an empirical program to save lives and prevent injuries . . . Under existing business values potential safety advances are subordinated to other investments, priorities, preferences, and themes designed to maximize profit" (Nader, 1965).

In response, G.M. hired detectives to investigate Nader in hopes of discrediting him. It later issued Nader a public apology and paid $425,000 to settle a civil action for invasion of privacy. These disclosures caused great public outrage and put pressure on the U.S. Congress to pass the Highway Safety Act and the National Traffic and Motor Vehicle Safety Act in 1966. During this time, the annual death rate from auto accidents approached 50,000. The Highway Safety Act mandated federal regulation of the automotive industry and led to the creation of an enforcement agency, the National Highway Traffic Safety Administration (NHTSA) (Cullen, 1994). The Motor Vehicle Safety Act required NHTSA to issue new safety regulations by January 31, 1967.

Ford management met with NHTSA in 1966 to convince the agency that auto accidents are caused by "people and highway conditions" (Dowie, 1994). One result of this meeting was an informal agreement that cost-benefit analysis could be used by auto manufacturers to determine auto safety decisions. Cost-benefit analysis is a business tool used to determine whether the cost of a project justifies the dollar value of benefits that would be derived. Cost-benefit analysis was first used at Ford by Robert McNamara, who eventually became Ford president. After McNamara left Ford to become Secretary of Defense under Presidents Kennedy and

Johnson, he implemented many government applications of cost-benefit analysis (Dowie, 1994).

Standard 301, which deals with fuel spill standards in accidents, was first proposed by NHTSA in 1968 (Fielder, 1994). When it was first proposed, Standard 301 had the potential to delay market release of Ford's new subcompact car.

FORD SUBCOMPACT CAR PROJECT

Ford's new subcompact car project was spearheaded by Lee Iacocca. Originally an engineer with a Master's degree in Engineering from Princeton, Lee Iacocca quickly shifted from engineering to sales when he was hired by Ford after graduation in 1946. By the mid 1960s, he was known as the father of the Mustang, having led the project that resulted in market release of the Mustang in 1964. Iacocca forcefully argued to Chief Executive Officer (CEO) Henry Ford II that the Germans and Japanese would capture the entire American subcompact market unless Ford released its own alternative to the Volkswagen Beetle. Because Iacocca wanted this car in American showrooms with the 1971 models, he ordered his car engineering vice president, Robert Alexander, to oversee the shortest production planning period at that time. Rather than spending the typical 43 months from conception to production, the Pinto schedule was set to just under 25 months (Figure 3.1). Iacocca also set an important goal he called "the limits of 2000." The Pinto weight limit was 2000 pounds; the Pinto cost limit was $2000 (Dowie, 1994).

Typically, marketing surveys and preliminary engineering precede the styling of a new auto model. However, with such a short schedule, styling preceded most of the engineering and dictated engineering design (see Figure 3.1). Because of styling constraints, locating the gas tank over the axle, which was known to prevent fire in rear-end crashes, was undesirable. The axle arrangement, in concert with styling constraints, resulted in a small luggage compartment that would be limited in carrying long objects such as golf clubs. To increase the size of the luggage compartment, the gas tank was relocated to the car's rear (Strobel, 1994) (Figure 3.2).

Because tooling (the production of equipment used in manufacturing processes) had a fixed time frame of 18 months, it began shortly after design. With $200 million invested in tooling, even poor crash test results, which should have triggered major gas tank redesign, did not delay the Pinto project schedule. The Pinto was not able to pass part of proposed (but not yet implemented) Standard 301, which limited fuel spillage to 1 ounce per minute when rear-ended by a barrier moving at 30 miles

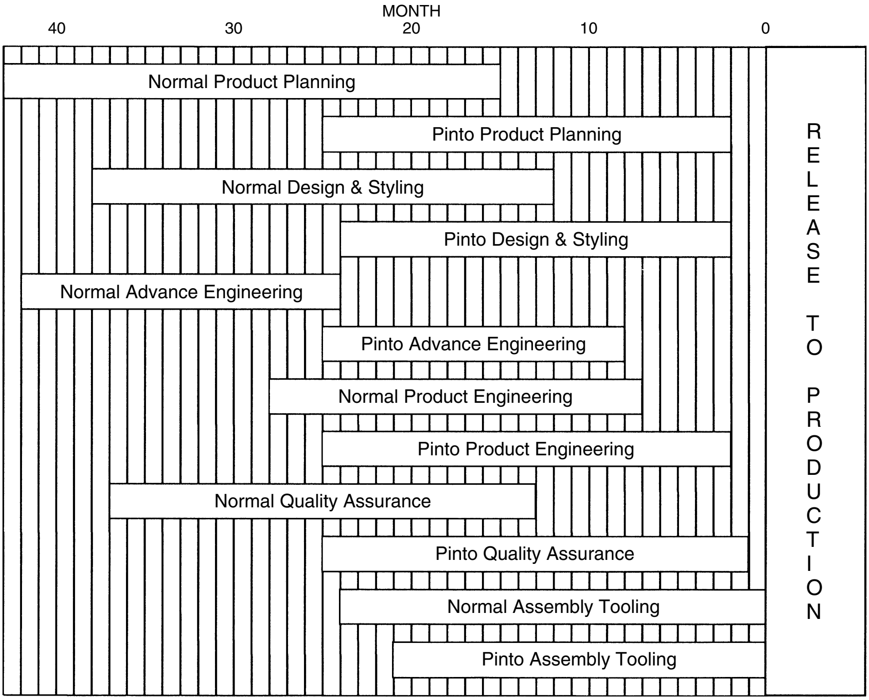

Figure 3.1 Automobile preproduction schedule.
Based on Dowie, 1994. Courtesy *Mother Jones* magazine.

per hour. Billed as "the carefree little American car," the Pinto retailed for $1919 when it was released on September 11, 1970. The price was about $170 less than the price announced for its soon-to-be released competitor, the Chevrolet Vega, and within $80 of the bestselling Volkswagen Beetle (Dowie, 1994).

As shown in Figure 3.2, the Pinto fuel tank was constructed of sheet metal and was attached to the auto undercarriage by means of two metal straps. The fuel filler pipe, which transported pumped gas to the fuel tank, was affixed to the inner side of the left rear quarter panel by means of a bracket firmly attached to the quarter panel surface. The fuel filler pipe extended into the top left side of the tank in a sliding fit through a sealed opening. The fuel tank held approximately 11 gallons for engine operation. With sufficient rear impact, the fuel filler pipe was completely dislodged from the tank, causing fuel spillage in a wide dispersive fashion. In impacts sufficient to puncture or tear the fuel tank, fuel spillage occurred in a pouring fashion (NHTSA, 1994a).

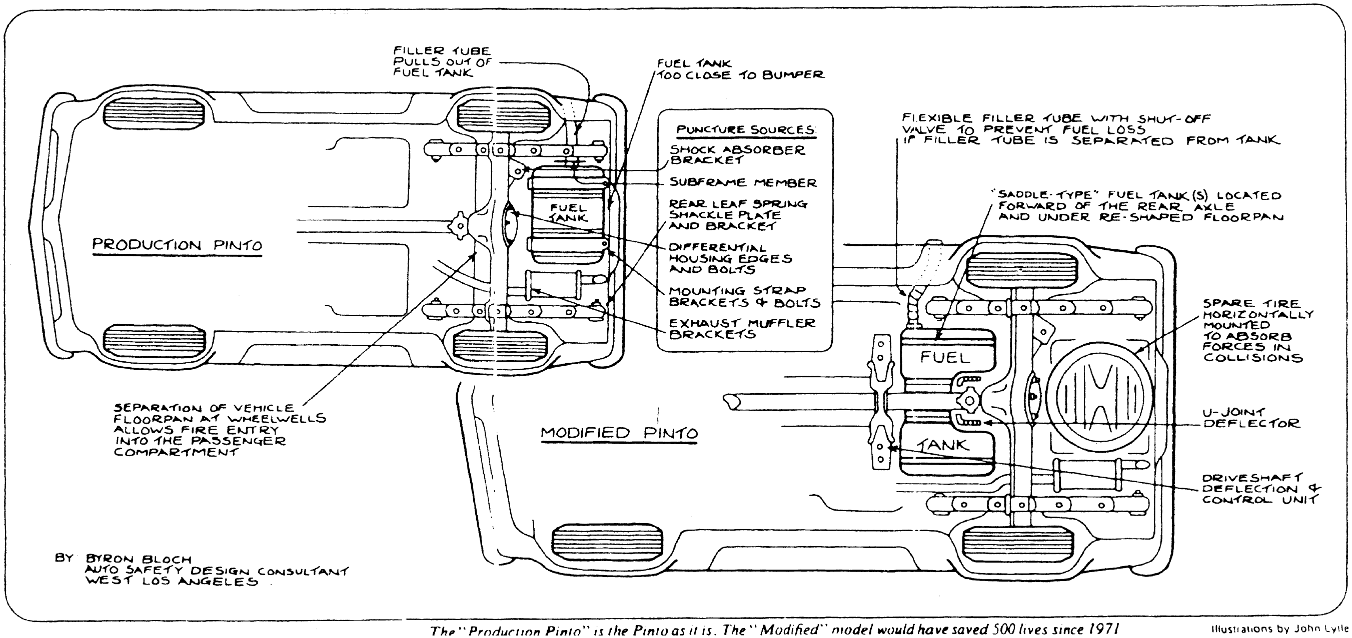

Figure 3.2 The "production" Pinto and a safer modified model.
From Dowie, 1994. Courtesy *Mother Jones* magazine.

In order to justify the rear gas tank location, Ford first argued, when Standard 301 was proposed in 1968, that fire was a minor problem in auto crashes. This caused NHTSA to contract several independent research groups to study auto fires. Robert Nathan and Associates found that 400,000 autos were burning each year, burning to death more than 3000 people. Ford lobbyists then argued that while burn accidents did occur, rear-end collisions were relatively rare. After another round of analysis, NHTSA determined that rear-end collisions were seven and a half times more likely to result in fuel spills than were front-end collisions. By 1972 these delay tactics had stalled passage of Standard 301 for 4 years.

When NHTSA determined in a 1972 report that human life was worth $200,725 (Table 3.1), Ford rounded the figure off to $200,000 and conducted a cost-benefits analysis for redesigning the Pinto.

It determined that the cost of $137 million far outweighed the benefit of $49.5 million (Table 3.2).

The analysis was based on a unit auto cost of $11 to strengthen gas tank integrity. Ford further delayed passage of Standard 301 by stating that rear-end collision deaths were caused by the kinetic force of impact,

Table 3.1
Societal Cost Components for Fatalities

Component	1971 Costs
Future Productivity Losses	
Direct	$132,000
Indirect	41,300
Medical Costs	
Hospital	700
Other	425
Property Damage	1,500
Insurance Administration	4,700
Legal and Court	3,000
Employer Losses	1,000
Victim's Pain and Suffering	10,000
Funeral	900
Assets (Lost Consumption)	5,000
Miscellaneous Accident Cost	200
TOTAL PER FATALITY:	**$200,725**

Adapted from Dowie, 1994. Courtesy *Mother Jones* magazine.

Table 3.2

Ford Cost-Benefit Analysis for Fuel Leakage

	Benefits	Costs
Savings/Sales	180 burn deaths 180 serious burn injuries 2,100 burned vehicles	11 million cars 1.5 million light trucks
Unit Cost	$200,000 per death $67,000 per injury $700 per vehicle	$11 per car $11 per truck
TOTAL:	**$49.5 million**	**$137 million**

Adapted from Dowie, 1994. Courtesy *Mother Jones* magazine.

not burns. After NHTSA again commissioned studies to analyze impacts versus burns, the Insurance Institute for Highway Safety determined through careful study that corpses taken from burned autos in rear-end crashes contained no cuts, bruises, or broken bones. These corpses would have survived the accident unharmed if the auto had not ignited. Ford also complained about the test conditions described in Standard 301.

Ford's arguments contributed to the passage of Standard 301 being delayed for 8 years in total, until 1976, during which time more than two million Pintos were manufactured (Dowie, 1994). The 1977 Pinto was the first model equipped with a protected fuel tank, prompted by the adoption of Standard 301.

PINTO INVESTIGATIONS

In 1977, Mark Dowie exposed the tendency of Ford Pintos to ignite during rear-end collisions and Ford's attempt to delay passage of a standard the Pinto could not meet. In his article for *Mother Jones* magazine, Dowie accused Ford of causing 500 to 900 burn deaths because it was unwilling to pay $11 more per vehicle for a safer gas tank (Dowie, 1994). This prompted NHTSA to investigate the Pinto's safety on September 13, 1977.

The results of NHTSA's investigation were released in May 1978. Investigation results were based on reports from consumers and Ford, examination of accident statistics, crash test results from tests commissioned by NHTSA, and motor vehicle record checks. NHTSA observed that "the fuel tank and filler pipe assembly installed in the 1971–1976 Ford Pinto is subject to damage which results in fuel spillage and fire potential in rear impact collisions by other vehicles at moderate closing speeds" (NHTSA, 1994a). The investigation conclusions are listed below:

1. 1971–1976 Ford Pintos have experienced moderate speed, rear-end collisions that have resulted in fuel tank damage, fuel leakage, and fire occurrences that have resulted in fatalities and non-fatal burn injuries.
2. Rear-end collision of Pinto vehicles can result in puncture and other damage of the fuel tank and filler neck, creating substantial fuel leakage, and in the presence of external ignition sources fires can result.
3. The dynamics of fuel spillage are such that when impacted by a full size vehicle, the 1971–1976 Pinto exhibits a "fire threshold" at closing speeds between 30 and 35 miles per hour.
4. Relevant product liability litigation and previous recall campaigns further establish that fuel leakage is a significant hazard to motor vehicle safety, including such leakage which results from the crashworthiness characteristics of the vehicle.
5. The fuel tank design and structural characteristic of the 1971–1976 Mercury Bobcat which render it identical to contemporary Pinto vehicles, also render it subject to like consequences in rear impact collisions. (NHTSA, 1994a)

One month after publication of the NHTSA report, Ford recalled 1.5 million Pintos and Mercury Bobcats, which had similar fuel systems. It replaced the filler pipe and added two polyethylene shields to help protect the tank. Ford estimated the recall cost $20 million after taxes (Strobel, 1994).

PINTO LAWSUITS

Numerous lawsuits were filed against Ford Motor Company by Pinto burn victims. The number filed has been estimated to range from several dozen to more than 100 lawsuits. Two lawsuits greatly affected Ford. In 1978 a jury awarded a Pinto burn victim $125 million in punitive damages. Although the damages were later reduced to $6.6 million, a judgment upheld on appeal prompted the appeals judge to assert "Ford's institutional mentality was shown to be one of callous indifference to public safety."

On August 10, 1978, three teenage girls died in a fire triggered after their 1973 Pinto was rear-ended by a van. Witnesses claimed to have seen a relatively low-speed collision. A grand jury indicted Ford on charges of reckless homicide. This was the first time a corporation was tried for criminal behavior. In order to prevent a legal precedent for all manufacturing industries, Ford assembled a defense team led by Watergate prosecutor James Neal. During the ensuing media trial, the defense convinced the jury that the Pinto involved in the accident was stopped when it was hit by the van. Therefore a low-speed collision did not occur, and the deaths were not the result of reckless homicide. Although Ford was found innocent, the reputation of the Pinto was forever harmed by the trial (Gioia, 1994).

APPLICABLE REGULATIONS

Portions of Motor Vehicle Safety Standard, Part 571; S301, are listed below. The rear-moving barrier crash requirement that the Pinto did not pass is S6.2. In this passage, GVWR stands for gross vehicle weight rating.

S1. Scope. This standard specifies requirements for the integrity of motor vehicle fuel systems.

S2. Purpose. The purpose of this standard is to reduce deaths and injuries occurring from fires that result from fuel spillage during and after motor vehicle crashes.

S3. Application. This standard applies to passenger cars, and to multipurpose passenger vehicles, trucks, and buses that have a GVWR of 10,000 pounds or less and use fuel with a boiling point above 32° F, and to school buses that have a GVWR greater than 10,000 pounds and use fuel with a boiling point above 32° F.

S4. Definition. "Fuel spillage" means the fall, flow, or run of fuel from the vehicle but does not include wetness resulting from capillary action.

S5. General requirements.

S5.1 Passenger cars. Each passenger car manufactured from September 1, 1975, to August 31, 1976, shall meet the requirements of S6.1 in a perpendicular impact only, and S6.4. Each passenger car manufactured on or after September 1, 1976, shall meet all the requirements of S6, except S6.5.

. . .

S5.5 Fuel spillage: Barrier crash. Fuel spillage in any fixed or moving barrier crash test shall not exceed 1 ounce by weight from impact until motion of the vehicle has ceased, and shall not exceed a total of 5 ounce by weight in the 5-minute period following cessation of motion. For the subsequent 25-minute period (for vehicles manufactured before September 1, 1976, other than school buses with a GVWR greater than 10,000 pounds: the subsequent 10-minute period), fuel spillage during any 1-minute interval shall not exceed 1 ounce by weight.

S5.6 Fuel spillage: Rollover. Fuel spillage in any rollover test, from the onset of rotational motion, shall not exceed a total of 5 ounces by weight for the first 5 minutes of testing at each successive 90° increment. For the remaining testing period, at each increment of 90°, fuel spillage during any 1-minute interval shall not exceed 1 ounce by weight.

S6. Test requirements. Each vehicle with a GVWR of 10,000 pounds or less shall be capable of meeting the requirements of any applicable barrier crash test followed by a static rollover, without alteration of the vehicle during the test sequence. A particular vehicle need not meet further requirements after having been subjected to a single barrier crash test and a static rollover test.

S6.1 Frontal barrier crash. When the vehicle traveling longitudinally forward at any speed up to and including 30 mph impacts a fixed collision barrier that is perpendicular to the line of travel of the vehicle, or at any angle up to 30° in either direction from the perpendicular to the line of travel of the vehicle, with 50th-percentile test dummies as specified in Part 572 of this chapter at each front outboard designated seating position and at any other position whose protection system is required to be tested by a dummy under the provisions of Standard No. 208, under the applicable conditions of S7, fuel spillage shall not exceed the limits of S5.5 (Effective: October 15, 1975)

S6.2 Rear moving barrier crash. When the vehicle is impacted from the rear by a barrier moving at 30 mph, with test dummies as specified in Part 572 of this chapter at each front board designated seating position, under the applicable conditions of S7, fuel spillage shall not exceed the limits of S5.5.

S6.3 Lateral moving barrier crash. When the vehicle is impacted laterally on either side by a barrier moving at 20 mph with 50th-percentile test dummies as specified in Part 572 of this chapter at positions required for testing to Standard No. 208, under the applicable conditions of S7, fuel spillage shall not exceed the limits of S5.5.

S6.4 Static rollover. When the vehicle is rotated on its longitudinal axis to each successive increment of 90°, following an impact crash of S6.1, S6.2, or S6.3, fuel spillage shall not exceed the limits of S5.6.

S6.5 Moving contoured barrier crash. When the moving contoured barrier assembly traveling longitudinally forward at any speed up to and including 30 mph impacts the test vehicle (school bus with a GVWR exceeding 10,000 pounds) at any point and angle, under the applicable conditions of S7.1 and S7.5, fuel spillage shall not exceed the limits of S5.5 (NHTSA, 1994b).

AN ENGINEERING PERSPECTIVE

In 1968, Ford was aware that the threat of fire in rear-end crashes could be reduced using relatively inexpensive fuel system design considerations. It had partially financed a study by UCLA researchers that had come to this conclusion. The study recommended that the fuel tank not be located directly adjacent to the bumper but moved above the rear axle.

In early 1969, 1½ years before the Pinto was introduced, Ford engineers took three Ford Capris and modified their rears to be similar to the proposed Pinto. For these tests, the fuel tank was moved from above the rear axle to the rear. When one was backed into a wall at 17.8 miles per hour, the welds on the gas tank split open, the tank was damaged when it hit the axle, the filler pipe pulled out, and the tank fell out of the car, resulting in massive gas spillage. Because the welds on the car's floor split open, gasoline could spill into the car interior. In two other tests, a car was rear-ended by moving barriers at 21 miles per hour. This caused gas to leak either from the filler pipe pulling out or from the punctured fuel tank (Strobel, 1994).

Even still, the engineers responsible for Pinto components signed off approval to their immediate supervisors. The Pinto crash tests were forwarded up the chain of command to the regular product meeting chaired by Robert Alexander, vice president of car engineering, and Harold MacDonald, group vice president of car engineering. Harold Copp, a former executive in charge of the crash testing program, testified that the highest level of Ford management decided to produce the Pinto, knowing that the Pinto could ignite during low-speed rear-end collisions and that design fixes were feasible at nominal cost (West's California Reporter, 1994).

Within a few months of the Pinto's release on September 11, 1970, a standard Pinto was crashed backward into a concrete wall at 21 miles per hour. In a report marked "confidential," engineer H. P. Snider reported that the Pinto's soft rear-end crushed 18 inches in 91 msec. According to Snider, "The filler pipe was pulled out of the fuel tank and fluid discharged through the outlet. Additional leakage occurred through a puncture in the upper right front surface of the fuel tank which was caused by contact between the fuel tank and a bolt on the differential housing" (Strobel, 1994). Additionally, the tank was punctured twice by nearby metal objects and both passenger doors jammed shut, which would have prevented quick escape or rescue during a crash. This pattern of gasoline spillage remained consistent in other crash tests at lower speeds. On December 15, 1970, when a Pinto was rear-ended by a moving barrier at 19.5 miles per hour, the filler pipe pulled out, causing gas to escape and the left door to jam shut.

Later, in early 1971, Ford engineers investigated various design changes to improve crash test results. With a heavy rubber bladder reinforced with nylon lining the metal gas tank, gasoline did not spill during a 26-mile-per-hour crash into a cement wall. The bladder was estimated to cost $6 per car. An alternative liner of polyurethane foam between the inner and outer metal fuel tank shells was estimated at $5 per car. To prevent fuel tank puncture by the differential housing, engineers suggested an ultra-high-molecular polyethylene shield, which was estimated to cost $0.22 per car. Normally, a Pinto would have been extensively damaged and spilled gas when crashed backward into a cement wall at 21 miles per hour. However, with the addition of two side rails, it sustained considerably less damage and did not leak gas. These side rails were estimated to cost $2.40 per car. Unfortunately, Ford executives decided against adopting any of these design changes. (Design changes require signature approval at several levels of management.) An October 26, 1971 memo labeled "confidential" documented that there would be no additional improvements for the 1973 and later models of the Pinto until "required by law" (Strobel, 1994).

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QUESTIONS FOR DISCUSSION

1. Should cost-benefit analysis include the costs of legal settlements and equipment recalls? What other factors could be considered in this analysis?
2. View *The Fog of War,* a 2003 documentary about Robert McNamara produced by Morris, Williams, and Ahlberg. Robert McNamara, who received a Master of Business Administration (MBA) from Harvard, viewed the world's problems as solvable through statistical analysis. Of which ethical theory does this remind you? Based on the film, how did McNamara use cost-benefit analysis in his decisions (1) on bombing raids over Japan during World War II? (2) on safety at Ford Motor Company? (3) on support for the Vietnam War as U.S. Secretary of Defense? Do you agree with each decision?
3. According to the *New York Times,* the median payment of families of September 11, 2001 victims by the U.S. federal government was about \$1.7 million. Three typical payments were summarized. A 26-year-old woman who worked as an accountant for annual compensation of \$50,000 at a financial services company in the World Trade Center received \$1.6 million. She was single and lived with her mother. A 40-year-old New York City firefighter, whose annual compensation was \$71,300, received \$1.5 million. He was single and was survived by two parents. A 33-year-old man who worked as an equities trader, for annual compensation of \$2 million, at Cantor Fitzgerald in the World

Trade Center received an undisclosed sum. No projected awards were released for people who made more than $231,000 a year. He was married, with two children (Chen, 2004). Account for the differences between the compensation awards in 2004 and the NHTSA human life estimate of $200,725 in 1972.

4. Could Ford engineers have banded together and postponed the market release of the Pinto?
5. Did Ford engineers meet their professional responsibilities of protection of public safety, technical competence, and timely communication of negative and positive results to management?