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Scope and Method of Study: On April 3, 1985, an all-terrain vehicle task force was established to review all-terrain vehicle accidents which had occured since 1982, and to continue their research through 1986. Similar studies were undertaken among the medical community who were seeing an alarming increase in the number of patients, primarily children, being treated for injuries related to all-terrain vehicles. These studies yeilded data including the number of deaths broken down by age, type of all-terrain vehicle, and cause of death, as well as number of reported injuries for the period from 1982 through 1986.

Findings and Conclusions: Three and four-wheeled all-terrain vehicles have become increasingly popular. Studies reveal that injury and death attributed to the ATV have also skyrocketed. Statistically, the three-wheel version has a much lower safety record than any form of off-road-vehicle. This is attributed to its three point isosceles triangular design, poor suspension, excess acceleration, and a high and rearward center of gravity. In spite of the design defects, the ATV industry has been accused of deceiving the public into believing the three-wheeler is safe. All ATV riders are at risk; however, the risk could be reduced through certain government regulations, operator training, and protective gear.

ADVISOR'S APPROVAL _____

LET THE RECORD SPEAK FOR THREE-WHEEL ALL-TERRAIN VEHICLES

by

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CHAPTER I

INTRODUCTION

Background and Justification

Young Billy Pleasants, a twelve-year-old resident of Clarksburg, Maryland, was an experienced rider and owner of a three-wheeled all-terrain vehicle (ATV). He knew the rules well: Never carry a passenger, stay off all paved surfaces and roads, always wear a helmet, and ride only when an adult is present. But nevertheless, Billy sometimes broke these rules.

On his last occasion to ride an ATV, Billy was impressed with his ability to handle the bike at excessive speeds. But his thrill was abruptly halted when he hit a ditch, was sent flying over the handlebars, and broke his neck and wrist on impact with the ground. Fortunately, even with these serious injuries, Billy survived. Unfortunately, not all victims of ATV accidents are as lucky as Billy (Morehouse, 1987).

All-terrain vehicles are used and driven for purposes ranging from law enforcement and ranch repair to thrill seeking and competitive racing. They are staunch and sturdy off-road-vehicles resembling a cross between a tricycle and a motorcycle. The ATV comes in both three and four wheel configurations. With their big balloon tires, they are

capable of transiting harsh terrains at high speeds.

The great number of accidents and deaths involving the three-wheel version of the all-terrain vehicle have aroused and angered the public, members of Congress, and the United States Consumer Product Safety Commission (CPSC) to question this vehicle's safety. But in spite of these concerns, the makers of ATVs claim the many injuries and deaths attributed to the vehicle are simply the results of operator errors and not ATV safety problems. However, ATV manufactures have been ordered to stop selling the three-wheel ATVs in the United States and have agreed to provide the opportunity for safety training to ATV owners (Moskowitz, 1987). However, this three-wheel all-terrain vehicle ban may only be temporary since the banning decree contains a provision that could allow the renewed sale of three-wheel ATVs (McAllister, 1988). Conflicts over whether or not the ATV industry should be allowed to return this vehicle to the market have given rise to an impending problem faced by the government and by consumers: Are three-wheeled ATVs inherently unsafe?

Purpose of Research

The purpose of this report is to examine three important government and consumer concerns regarding three-wheeled all-terrain vehicles. First, to expose the recent safety record of all-terrain vehicles while noting the safety comparison between two-wheelers, three-wheelers, and four-wheelers; next, to review the basic design of the three-wheeled all-

terrain vehicle to determine if any weaknesses exist, and finally, to identify ways in which the consumer may reduce risks of injury from ATV use.

Assumptions and Limitations

This investigation is limited by the following factors:

1) The review of literature concentrates on two, three and four-wheeled off-road vehicles of motorcycle design and makes brief comparisons with snowmobiles, but excludes dune buggies, go-carts and other such off-road-vehicles (ORVs) in order to narrow the scope.

2) All studies and data reflect statistics pertinent to only the United States and Canada.

3) Since not all injuries involving ATVs are reported, data includes only those accidents resulting in emergency treatment, hospital admission, or death.

4) This report includes statistical data of those who were injured, but from a consumer standpoint, some important denominator data has not been considered in the literature since it would be impossible to gather or estimate, more specifically, the number of persons who are currently at risk of injury.

Definitions of Terms

The following definitions are applied to selected terms and phrases in this report:

ATV - All-terrain Vehicle. Any motorized off-highway vehicle of 50 inches or less in width, having a dry weight of 600 pounds or less, traveling on three or more large low pressure balloon tires and having a seat designed to be straddled by the operator.

Balloons - A common name given to the large soft ATV tires with square rubber protrusions or knobs for good off-road traction.

Inherently Unsafe - When machinery, tools, or otherwise can not be operated in a reasonably safe manner even when following the parameters eluded to or specified by the manufacturer.

CPSC - The United States Consumer Product Safety Commission. An independent federal agency whose role is to protect the public from products which pose unreasonable risks of injury and death.

Footpeg - Horizontal bar or platform below the engine on which an ATV operator should support his or her feet while riding.

ORVs - Off-road-vehicles. A large category of vehicles including ATVs, go-carts, motorcycles, snowmobiles, dune buggies, and all other vehicles specifically designed for off-road use.

Soft Tissue Injuries - Trauma such as cuts, scrapes, bruises, and burns to the skin and underlying tissues with no bone, tendon, muscle or organ involvement.

SVIA - Specialty Vehicles Institute of America. An institute or organization that represents the ATV industry, and is responsible for providing safety information to the consumer.

Safe Turn - No tipping is experienced.

Tipping - A term used to denote the instability of any vehicle (off-road or otherwise) by illustrating that one or more wheels have left the ground while the vehicle demonstrated a turn.

CHAPTER II

REVIEW OF LITERATURE

The Safety Record

The ATV has proven its versatility. It is used on farms and oil rigs and provides entertainment, excitement, and even prize money for the winnings on racing circuits that have sprung up since its production. They are cheap to buy and can be operated on pennies worth of fuel (Haynes, Stroud, & Thompson, 1986). These and other attractive qualities have helped the ATV to gain substantial popularity with the general public. Unfortunately, this increasing popularity has been associated with a rising toll of injury, especially in the young (Henderson, 1987). So many accidents have been reported that documentation of the severity and frequency of injuries has begun to appear in several recent reports along with government directed alerts about the possible dangers associated with three-wheeled all-terrain vehicles (Shipman, 1987).

On February 9, 1987, the United States Consumer Product Safety Commission released a letter to the Governors of all 50 states requesting them and their colleagues to take actions to help reduce the risk of injury or death to ATV riders. This federal government agency took such actions

based on recommendations of the ATV Task Force that was established on April 3, 1985, to study and evaluate the all-terrain vehicle's safety record (Consumer Product Safety Commission [CPSC], 1987).

The task force reviewed ATV accidents from the beginning of 1982 to November 6, 1986. This data showed that accidents and injuries increased at a significant rate each year. Even more alarming was the death toll attributed to ATVs as shown in table I.

TABLE I

ATV INJURIES AND DEATHS (1982-1986)

Year	Injuries	Deaths	Cumulative
1982	8,600	26	26
1983	26,900	81	107
1984	63,900	138	245
1985	85,900	244	489
1986	86,400	155	644

Table derived from CPSC research.

According to the CPSC (1987), about half of the over

270,000 injuries and 47 percent of the 644 ATV related deaths were sustained by children less than sixteen years old. Unfortunately, 21 percent of those deaths involved children younger than twelve.

The task force revealed that the highest occurrence of incidents occurred in New York (50), California (46), Wisconsin (34), Pennsylvania (32), and Michigan (30); but, deaths occurred throughout the United States (see table II).

TABLE II

DEATHS PER STATE

State	Toll	State	Toll	State	Toll	State	Toll
AK	26	IN	13	NC	10	RI	1
AL	17	KS	12	ND	8	SD	4
AR	28	KY	8	NE	6	TN	13
AZ	11	LA	22	NH	9	TX	12
CA	46	MA	10	NJ	6	UT	16
CO	1	MD	3	NM	10	VA	12
CT	3	ME	12	NV	3	VT	4
FL	23	MI	30	NY	50	WA	9
GA	6	MN	25	OH	17	WI	34
IA	9	MO	11	OK	5	WV	9

TABLE II (Continued)

State	Toll	State	Toll	State	Toll	State	Toll
ID	5	MS	25	OR	6	WY	1
IL	15	MT	6	PA	32		

Table derived from CPSC research

It was these statistics, released by the CPSC, that provoked nationwide concern. Attorneys generals from 23 states quickly joined together and urged all-terrain vehicle manufacturers to assist in a campaign to reduce the growing number of accidents involving these machines (Merline, 1987).

On December 18, 1986, manufacturers were urged to voluntarily stop selling recreational three-wheel vehicles for children under twelve years-old ("Makers," 1986). Just one year later in December 1987, the Justice Department and Consumer Product Safety Commission hailed a consent decree to ban sales of the three-wheel series of ATV on the American market (McAllister, 1988).

The four-wheeled all-terrain version is safe from any government intervention for now with the manufacturers rallying behind their product. Of the injuries and deaths overshadowing the ATV industry, it is important to highlight

the safety record differences between the three-wheeled and four-wheeled versions, especially since most statistical studies, news and broadcast media has continued to group both all-terrain vehicle series under one general as well as undistinguishable heading--the ATV.

Four-wheeled all-terrain vehicles were reported in 31% of the fatal ATV accidents in 1986, in 18 % of ATV fatalities in 1985, and in only 5 % in prior years. By comparison of statistics, the three-wheeled ATV was responsible for 69 % of the fatal accidents reported in 1986, 82 % in 1985, and 95 % of ATV fatalities in the preceding years as noted in table III (CPSC, 1987).

It is also important to make short mention of the safety record attributed to snowmobiles and two-wheeled off-road motorcycles (trailbikes and minibikes). This yeilds a comparative base-line to judge the ATV safety record.

While use of ATVs resulted in 63,900 injuries in 1984 alone, during that year 33,636 injuries from off-road trailbike and minibike use were reported, and snowmobile injuries totalled only 8,076. The percentage of cases hospitalized for ATV, minibike/trailbike, and snowmobile injuries were 13.5 % , 5.1 % , and 10.4 % respectively ("Injuries," 1985). However, these two-wheeled series of the off-road-vehicles and snowmobiles have enjoyed wide popularity since the 1960s and a great many more two-wheelers existed which renders this injury comparison invalid. But some revealing comparative data does exist.

Between 1980 and 1987, the CPSC collected only 24 death certificates that implicated off-road minibikes and trailcycles. Unfortunately, just as with the all-terrain vehicle half of those who died were children 14 years of age or younger (Greensher et al., 1987). As compared with the 644 deaths between 1982 to November 1986 in which ATVs were implicated, the numbers would suggest the all-terrain vehicle to be less safe. However, the most scientific results show that as of 1983 there were 21.7 to 22.2 ATV-associated injuries requiring hospital emergency room treatment per 1,000 vehicles in use, of which 2.58 to 2.64 injuries per 1,000 vehicles in use required actual hospitalization. In contrast, during the same period of time, there were 17.9 minibike and trailbike-associated injuries which required emergency room treatment per 1,000 vehicles in use, of which only 1 per 1,000 vehicles in use required hospitalization (Sneed, Stover, & Fine, 1986).

This data clearly shows that at least the severity of injury sustained from all-terrain vehicle accidents is much greater than that of other forms of ORVs. And, as shown in table III, separating ATVs by wheel category, that is, three versus four, demonstrates that the risk of death when operating a three-wheeled all-terrain vehicle is far greater than that of operating the four wheeled version (Haynes et al., 1987).

TABLE III

DEATH COMPARISON FOR THREE AND FOUR WHEELS

3-Wheeled ATVs			4-Wheeled ATVs		
Year	Deaths	Percent*	Year	Deaths	Percent*
1982	25	95%	1982	1	5%
1983	77	95%	1983	4	5%
1984	131	95%	1984	7	5%
1985	200	82%	1985	44	18%
1986	107	69%	1986	48	31%

* Percentage of the total ATV deaths by year

Table derived from CPSC research

But even in the face of these alarming statistics, the three-wheel ATV manufacturers have taken the anti-consumer position that these machines are safe and that any problems are due to consumer misuse. To the dismay of consumer groups and the CPSC, less than 24 hours after the decree to ban the three-wheeled ATV version, some ATV industry spokesmen were speaking of returning their product to the American market, perhaps within months. Furthermore, this talk of returning the three-wheel all-terrain vehicle is a real possibility

since the banning decree contains a provision that could allow sales to resume sometime as early as this year (McAllister, 1988).

Canadian consumers are also concerned with the ATV injury statistics attributed to the three-wheeled version. Eight hospitals in the Canadian province of Manitoba reported 375 hospitalizations of patients under 17 from all-terrain vehicle accidents between April 1979 and August 1986. Injuries which required actual hospitalization increased from 13 in 1980 to 62 in 1985. Also, the study revealed 233 children with bone fractures and soft tissue injuries. Sixty fractures involved the growth area within the children's bones which is known to cause slow or abnormal growth. But the most upsetting fact was that 21 of the children under 17 died from the injuries they received as a result of their ATV accident ("ATV Injury," 1988).

The literature suggests that Canadian and American consumer fears of the all-terrain vehicle's dangers are well founded. But in order to confirm that it is the vehicle which poses a hazard to riders, the machine's design must be considered.

Design Factors

What makes the three-wheeled ATV unsafe? According to the literature, the major cause of accidents, injuries, and deaths is the three-wheel tricycle pattern, and the unstable handling characteristics that stems from an overall poor

design (Merline, 1987).

Most injuries associated with ATVs occur at times when the driver losses control, the vehicle rolls over, the driver is thrown from the vehicle, or the driver collides with a fixed obstacle. Again, most accidents occur on the three-wheel series of the ATV and appear to be at all speed ranges, including slow speeds (McDonald & Stribling, 1983).

Several characteristics of three-wheeler operation and design appear responsible for the frequency of accidents leading to serious injury. The literature identifies these characteristics as being particular to the three-wheel design and may not be applied to the four-wheeled versions (Cogbil, Landercasper, Strutt, & Metheny, 1986). In fact, four-wheel models are generally considered, and statistically proven to be safer than the three-wheeled ATV models ("Will the Government," 1987).

As soon as the three-wheeled ATV was introduced on the American market in 1971, it was identified as causing accidents due to vehicular instability (Golladay, Slezak, Mollitt & Seibert, 1985). This indicated a design flaw.

This vehicle was designed in an unconventional manner by Mr. Tamagouchi, a Japanese researcher, who, through a trial-and-error process that began by using a modified motorcycle, designed the three-wheeled all-terrain vehicle. The three-wheeler was designed to incorporate an isosceles triangle having an apex of 37 degrees. The footpegs were fitted along the two equal sides at 40 percent of the length

(Haynes et al., 1987). The three-wheeled ATV was designed to have a displacement varying from a 50 cc to a 250 cc engine, with a dry weight variations of 170 to 600 pounds (Golladay et al., 1985), and with engines that have gear capabilities for some models to attain speeds of up to 70 miles per hour. This combination of specifications incorporated in the triangular design made for an unsafe, and often uncontrollable vehicle (Cogbil et al., 1985b).

Since the four wheel all-terrain vehicle versions do not share this unsafe triangular design, researchers have compared it's handling characteristics with three-wheelers. When the area required for a three-wheeler to make a safe turn at a specified velocity is compared to that of the four wheel ATV the instability of the triangular design becomes dramatically apparent.

If the speed and acceleration of the particular vehicle are considered, the radius in footage required to achieve a turn (no wheel leaves the ground) can be mathematically calculated (see table IV). For example, a three-wheeler traveling at 15 miles per hour needs a radius of 45 feet in order to achieve a successful or safe turn without any tipping, whereas the four-wheeler traveling at the same speed only requires 18 feet. The inability of the three-wheeler to make turns without tipping within a reasonable radius is the major key to the high frequency of accidents (Haynes et al.,1987).

TABLE IV

TURN COMPARISON FOR THREE AND FOUR WHEELS

Three-Wheeler		Four-Wheeler	
Speed (mph)	Radius (feet)	Speed (mph)	Radius (feet)
5	5	5	2
10	20	10	8
15	45	15	18
20	80	20	32
25	125	25	51
30	180	30	73

Table derived form Haynes et al. (1986)

This comparison of turn radius differences demonstrates the fact that the three-point wheelbase design predisposes an ATV to tipping over on flat surfaces. The tendency to tip is also increased when traveling across an inclined or uneven "all-terrain" surface (Cogbil et al., 1986). Also, unlike a two-wheeled motorcycle in which one naturally leans into a turn, the three-wheel rider must lean opposite a turn; an unnatural and sometimes difficult maneuver (Sneed et al., 1986). The oversized soft balloon tires add even further to

the danger of rollover accidents. A driver's foot may easily be caught by the large knobs protruding from these balloons if the foot slips from the metal footpegs (Cogbil et al., 1985b). This seems to be a common occurrence when driving on uneven and rough terrain due to the three-wheeled ATV,s general lack of a rear suspension system capable of absorbing shocks resulting from "all-terrain" bumps (Sneed et al., 1986). Quick acceleration of these rear axle, chain-driven vehicles can also result in the three-wheeler abruptly tipping over backwards (Cogbil et al., 1985b). This is contributed to by a high and rearward center of gravity (Haynes et al., 1987).

Another key to the high frequency of accidents is thought to be the deceptive appearance of stability. This is most evident when viewing the great amount of children injured or killed each year. Well-meaning parents usually expressed the belief that their "toy" three-wheeler was safe because the wide tripod base appeared to provide great stability (Golladay et al.,1985), a characteristic relatively appealing to parents who would not otherwise allow a child to operate a motorcycle-type vehicle. The tripod base has been used as a stable platform for fixed objects for many years. With a fixed object, this design provides relative stability especially when the object has a low center of gravity. But the three-wheeled ATV is not a fixed object and does not have a low center of gravity. This false appearance of stability was in part due to the manufacturers which provided

advertisements to influence the public's perception that these three-wheeled vehicles were as safe or safer than two-wheelers.

Marketing Deception

The three-wheeled all-terrain vehicle, which appears deceptively simple, is commonly considered the next stage in the tricycle. While the ATV manufacturers weren't doing anything illegal by supplying adolescents with these rugged trike-like "toys," their actions may be considered unethical because of their refusal to inform the public of the high rate of childhood injuries, deaths, and overall dangers involved with vehicular use. Even the required warning message the manufacturers were forced to display was postage-stamp in size and placed to the rear of the seat, frequently hidden by a bike rack (Haynes et al., 1987).

Not only were the manufacturers considered unethical, but the same was said of the ATV dealers. In a recent journal report, Doctor Golladay et al. (1985) questioned four dealerships in the central Arkansas area about safety and reliability of the vehicles for an eight-year-old child. In three of the four, dealers denied the danger claims about the three-wheeled ATVs, and tried to make a sale. However, one dealer stated that he refused to sell a three-wheeler to be used by an eight-year-old.

As noted, the dealer's reluctance to sell to such a young rider is not usually the case. Since marketing of

three-wheelers began, advertisers have seemed to play on the very adventuresome nature of children and adults alike. Even what would seem to be non-advertisement magazine articles concerning the ATV often reflected the adventure aspect that could be shared by all ages. One such article begins:

> Versatility? Is that what you want? How about a $1,500 nearly unbreakable tricycle that can clamber anywhere a horse can go, be lifted by one man and outperform a snowmobile on snow and a dirtbike on sand? And it'll bring home a hunter, all his gear, run all day on a gallon of gas and top 50 mph. And it's so simple, a nine-year-old can ride it and repair it too (Taylor, 1982).

Television and brochure advertisements for these three-wheeled vehicles promote their use by children, particularly as joint parent/child activities. For example, a father is shown on the larger three-wheeler and the son is on the smaller model riding over rough terrain. In another, a small boy and an adult are shown together by their ATVs in a field surrounded by stumps and large broken branches (Sneed et al., 1986). It is also common to see unrelated advertisements and television scenes which include the three-wheeled ATVs being ridden by unhelmeted children. To some extent, unrelated industries seem to be using the ATV to help lend a "macho" image to their product.

The fact that advertisements and dealerships targeted the family and more specifically young children, provided minimum information on specifications and emphasized the fun, adventure, and sporting aspects of the vehicle prompted the CPSC to force manufacturers to release an ATV safety alert,

and initially ask the industry to stop marketing ATVs for children under twelve. This was their first step in reducing ATV injury and working toward a total three-wheeler ban (Morehouse, 1987). When the ban did occur, consumer groups attacked the agreement, saying it abandons a commission request to seek refunds for recent purchasers of three-wheeled ATVs, and does not prohibit the sale of three-wheelers which had previously been delivered to dealerships but had not yet been sold (McAllister, 1988). Basically, other than providing the opportunity for safety training, the makers refused to take any actions to help reduce the hazard to present three-wheeled ATV owners (Taylor, 1987). However, consumer groups did concede satisfaction over CPSC direction for the industry to take various steps to educate purchasers of both three-wheeled and four-wheeled ATVs about the hazards of driving the vehicles. The Specialty Vehicle Institute of America (SVIA) was employed to present safety tips to consumers. The information found in the SVIA safety guides are very well written, accurate, and with out a doubt helpful; but, the deceptive theme of ATV adventure is reinforced to the consumer by the large-lettered "ATVenture" banner that appears on the cover of all SVIA safety material.

Reducing Risks of Injury

Accident prevention must begin with increased awareness of the potential dangers of these vehicles. Special skills different from those necessary for motorcycles and standard

bicycles, are required to operate three-wheelers (Cogbil, Landercasper, & Metheny, 1985).

Other potential risk factors for injuries associated with the three-wheel series, but not directly attributed to ATV design defects, include alcohol use, ineffective helmet and safety gear use, and rider inexperience ("Injuries," 1985).

Most consumer groups agree injury would be reduced by regulating the vehicles in use. This would include the establishment of a minimum age for ATV operators (Sneed et al., 1986) since experts claim that children under 12 are unable to operate any size three-wheeled all-terrain vehicle safely due to a lack of strength, coordination, and basic understanding of the machines ("All-terrain," 1986). Also, limiting maximum speed could reduce not only the frequency, but also the severity of injury (Haynes et al., 1987). Requiring drivers to hold licenses based on demonstrated competence could ensure that riders possessed the skills necessary to handle three-wheeled ATVs safely (Greensher et al. 1987). As previously stated, the ATV manufacturers must see that ATV owners are provided the opportunity to attend safety training. By, regulating this training to include how to judge speed and distance, evasive maneuvers, braking, and steering techniques could help reduce accidents which subject riders to injury (Haynes et al., 1987). Finally, requiring protective clothing gear and helmets, since death and disability is significantly increased when helmets are not

worn, would reduce injury (McSwain & Petrucelli, 1984).

But ATVs are considered "off-the-road" vehicles. Therefore, the only law pertinent to their operation is one which forbids their use on public highways (Cogbil et al., 1985b). But with the absence of state and governmental regulation, one can only make recommendations to the all-terrain vehicle rider about what may reduce accidents and injury.

Several recommendations appear in the current literature dealing with reducing risk for all-terrain vehicle riders: 1) Do not allow children under 16 to ride adult sized three-wheeled ATVs (Merline, 1987). 2) Take a safety training course (Haynes et al., 1987). Nearly 50 % of the riders who were injured on an ATV had less than one year's riding experience (CPSC, 1987). 3) Wear safety gear (McSwain & Petrucelli, 1984). Over half of those injured on ATVs were not even wearing a helmet (CPSC, 1987). 4) Don't ride with passengers (Merline, 1987). 31 % of the ATV riders injured rode with passengers, and 21 % of those injured were passengers (CPSC, 1987). 5) Don't drive an ATV while using alcohol (Merline, 1987). 31 % of all ATV-related deaths involved alcohol use (CPSC, 1987). 6) Don't drive on paved surfaces, ATVs were made for loose dirt and sandy soil, and it's against the law to ride all-terrain vehicles on public roads (Cogbil et al., 1985b). Even so, 25 % of deaths involved all-terrain vehicles being driven on paved, public roads (CPSC, 1987). 7) Drive only the four-wheeled instead

of three-wheeled versions (Merline, 1987). Due to design weaknesses, the risk of accident on a three-wheeler is twice that of a four wheeler (CPSC, 1987). Unfortunately, even if the all-terrain vehicle rider takes great safety precautions, the three-wheeled ATV is inherently unsafe and the consumer would be better protected by choosing other forms of recreation rather than the operation of three-wheeled all-terrain vehicles (Greensher et al., 1987).

CHAPTER III

CONCLUSIONS

A Summary of Consumer Concerns

Several conclusions are apparent from a review of recent literature concerning off-road-vehicles. Of the off-road-vehicle category, a significant amount of injuries and deaths involving young children have occurred as a result of mishaps involving all-terrain vehicles (CPSC, 1987). The majority of severe injuries have been attributed to the three-wheel ATV type. Injuries often occur when the driver losses control, the vehicle rolls over on top of the rider, the driver is thrown from the vehicle, or collides with some fixed obstacle (Greensher et al. 1987).

Several characteristics of the three-wheel all-terrain vehicle design seem responsible for its poor safety record. The inability of the three-wheeled model of triangular design to make a safe turn (with no tipping) in a reasonable radius, the large balloon tires which can easily catch a rider's foot when it has slipped from the footpeg, a slightly rearward and high center of gravity, quick accelerations, lack of an adequate rear suspension and unnatural body maneuvers which are required of the rider in order to prevent tipping and rollovers, all combine together to classify the three-wheeled

all-terrain vehicle as inherently unstable (Sneed et al., 1986). Unstable with any age rider on any surface at any speed. When these negative attributes are overlooked because of advertisements that elude to the fun and adventure a young child could experience at high speeds on rough terrain and the general public's lack of understanding about the vehicle due to its deceptive appearance of being as safe or safer than the two-wheeled off-road vehicles, then the three-wheeler is classified as inherently unsafe (Sneed et al., 1986).

Consumers should note that in the case of three-wheeled ATVs, their persistent voice against the vehicle has led to the United States government banning the manufacturers from providing additional vehicles to dealerships. However, dealers may still sell those three-wheelers in stock, and riders have received no mandatory safety regulations governing ATV use. The reason for this is that manufacturers of the three-wheeled all-terrain vehicle have taken, as manufactures often do, an opposing side against the consumer. The ATV makers have openly blamed the consumer as the sole cause of three-wheeler accidents. These ATV manufacturers have full intention of fighting consumer groups and insisting that the government again allow their access to the American market (McAllister, 1988).

If the three-wheeler is returned to the market without major design modifications, it will be a defeat for the consumer. This makes it apparent that consumers should

continue to push for regulation and training along with mandatory protective attire since these means are proven to reduce the accident, injury, and death toll (Haynes et al., 1987). Several avenues can be taken along these lines. First, at the point of purchase, the ATV dealership could be required to provide safety gear as a part of the vehicle purchase. This gear should include such items as a helmet, gloves, and rider's boots. Secondly, each vehicle should be titled. By titling ATVs, one can always track the owners; then, when vehicles are resold and re-titled a safety information package could be forwarded to the new purchaser. Thirdly, licensing drivers was strongly indicated by current literature as necessary to reduce accidents. As previously stated, requiring drivers to hold licenses based on a demonstrated competence could ensure that riders possessed the skills and knowledges required to operate an ATV safely (Greensher et al. 1987). Also, licensing would lend itself to the application of a minimum age requirement as well.

When consumer groups consider such legislation, the policy implications must be weighed as to what crossover effects they may have in other areas. But in the case of three-wheeled ATVs, the safety record has proven that measures must be taken to regulate these vehicles.

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