

Citizen Report on Utility Terrain Vehicle (UTV) Hazards
and Urgent Need to Improve Safety and Performance
Standards; and Request for Urgent Efforts To Increase
Yamaha Rhino Safety and Avoid Needless New
Catastrophic Injuries, Amputations and Deaths

**Safety Changes Are Urgently Needed
For The Yamaha Rhino Because It
Has Substantial Designed-In Product
Hazards And Is Associated With
Literally Thousands of Rollovers and
Hundreds of Devastating Injuries,
Including Amputations, Crushes,
Fractures, Acute Compartment
Syndrome, Surgeries, Other
Disabling and Permanent Injuries,
and Dozens of Deaths**

Report Date: February 26, 2009

Dedication, By Heidi Crow

This report is dedicated to my beloved son J.T. Crow, who in his short life taught me kindness and compassion and whose light will be eternally missed by all who had the opportunity to experience him. Also, for the hundreds of other children and adults who were killed or maimed by the Yamaha Rhino and the families of these victims that have the passion to tell their stories to anyone who will listen and for all those that have listened, been inspired and had the courage to make our stories their cause, contributing countless hours of hard work, dedication and expertise, believing unwaveringly that together we will create long overdue and necessary change.

**Beloved J.T. Crow, age 9, killed by Yamaha Rhino
rollover on June 22, 2007**



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1. Introduction

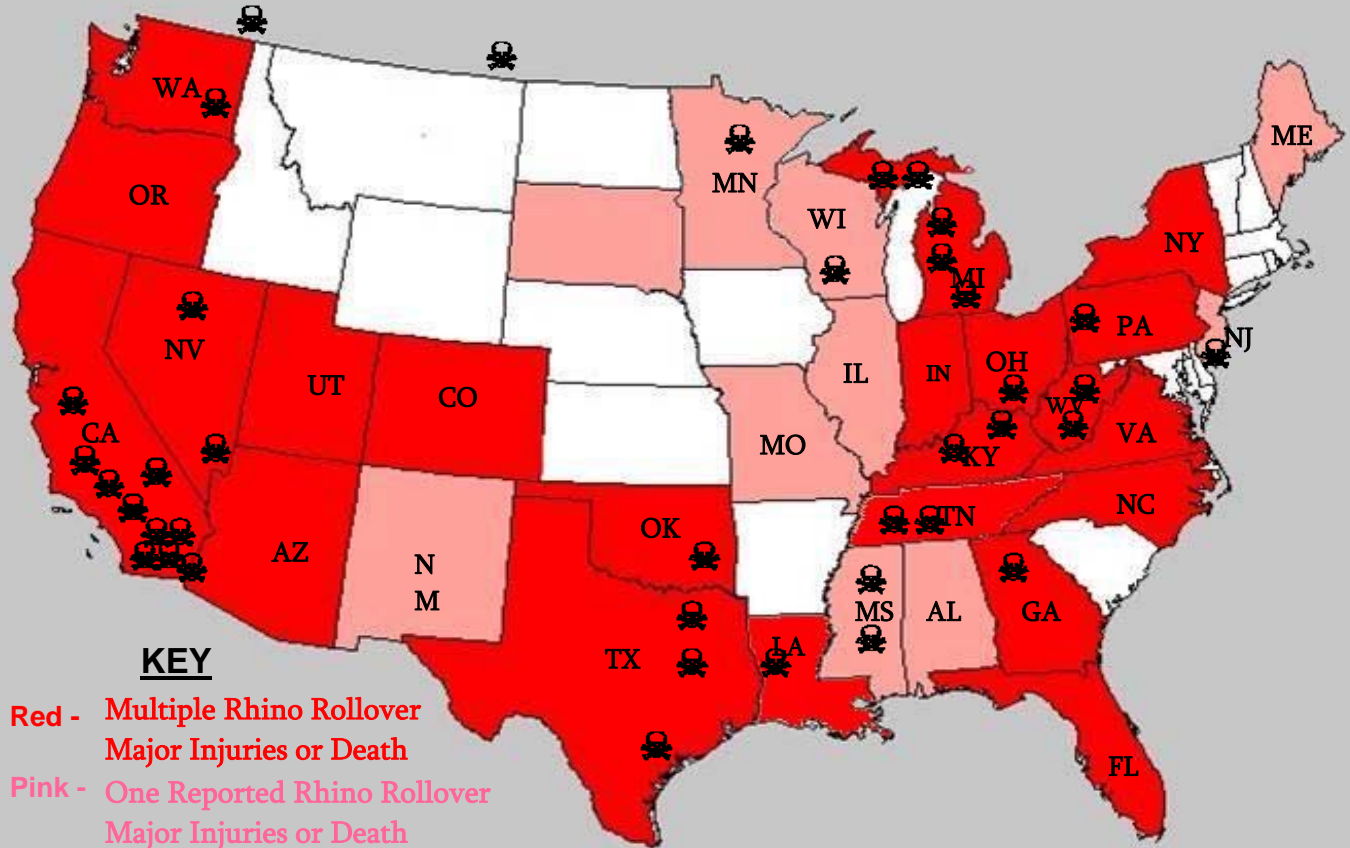
Heidi Crow of Texas; William, Melanie and Sunny Katherine Chism of Texas; Edna and Justin Miller of California; John and Tammie Sand of Ohio; Billy James of Mississippi; the Trauma Foundation; and the Center for Auto Safety, hereby report on life-threatening hazards posed by Utility Terrain Vehicles (“UTV”), including vehicles also known as: Side-by-Side Vehicles, Utility Off Road Vehicles (UOV), Recreational Off Road Vehicles (ROV), and Multi-Purpose Off Road Vehicles (MOV). This report is focused on the Yamaha Rhino.

The Yamaha Rhino and some of the other sport-based UTVs have a much greater propensity to roll over than any passenger vehicle or truck on the road. There are, however, no governmental minimum safety performance standards currently applicable to these vehicles. Such standards are vitally important to prevent occupants from being seriously injured during rollover. Yamaha Rhinos lacking adequate occupant protection have injured, maimed or killed literally hundreds of consumers.

The Yamaha Rhinos’ causation of extraordinary morbidity and mortality results from the vehicle’s extreme instability combined with its designed-in failure to adequately contain occupants. Yamaha Rhinos also lack effective seatbelts and have unpadded roll cages that make the vehicles much more dangerous than comparable vehicles during a rollover. While Yamaha has offered all Rhinos a retrofit half door through its August 27, 2007 “Special Offer” door retrofit program, Yamaha concedes the half door retrofit has only been provided to an estimated 50% of Rhino owners.

2. **Yamaha Rhinos Have Catastrophically Injured Hundreds Of Consumers And Killed Dozens, See Pages 39-52 For Lists And Details Of Dozens Of Rhino Injuries And Deaths**

Yamaha Rhino Rollover Injuries and Deaths



KEY

- Red - Multiple Rhino Rollover Major Injuries or Death**
- Pink - One Reported Rhino Rollover Major Injuries or Death**
- ☠ - Rhino Rollover Fatality**

Data compiled from reports to Lief, Cabraser, Heimann and Bernstein, LLP, news reports and publicly available Consumer Product Safety Commission documents.

Date Printed: 02/02/09

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3. **Needless Death Of J.T. Crow From Tippy, Doorless Rhino With Unpadded Roll Cage**



Beloved J.T. Crow was only a few months away from celebrating his 10th birthday, when he was killed on June 22, 2007 in a rollover of a doorless Yamaha Rhino; 8 weeks later Yamaha offered free doors for all Rhinos ever made, but never actually recalled the vehicles.

Jeremy Todd Crow, aka J.T. and Bubba, was a happy and vibrant 9-year-old boy, until he was killed by a Yamaha Rhino rollover. On June 22, 2007, J.T. and his older sister Madison went for a ride in the family's recently purchased, new 2007 Yamaha Rhino 450. With Madison driving prudently, the dangerous and unsafe Rhino tipped over. J.T. Crow was wearing his safety belt. The ATV did only a quarter roll at very low speed, and still J.T. was ejected, crushed and fatally injured. He was pinned beneath the half-ton Rhino vehicle and sustained massive head and neck injuries from the dangerous unpadded roll cage.

J.T. is survived by his parents, Jeremy Sr. and Heidi Crow and his siblings Madison and Kenny. In loving memory, the Crows have established Bubba's Angels and the J.T Crow Memorial Fund, two foundations that are working to prevent repeat fatalities and accidents in Rhinos. Heidi Crow and her family led an ATV Awareness Day in Winnsboro, Texas in 2007, where dozens of citizens marched for ATV safety in honor of J.T.

4. Ellie Sand, Age 10, Killed By Padless Roll Cage Of A Yamaha Rhino Which Rolled Over On October 28, 2007



Beloved 10-year-old Ellie Sand loved life. She loved to dance and as a dancer she won many awards. She loved to play tennis, ride dirt bikes, and play with her brothers Grant, Wesley, Cosby, and her baby sister Lila. Courage, drive, determination, hard work, zest and initiative describe the core of who Ellie was. She was willing to try anything and everything. She was known to say “I’ll figure out a way.” After Ellie’s death, her dance studio started an annual award in her memory—The Ellie Sand Award—an honor given to the hardest working dancer.

On October 27, 2007 Ellie was taken for a ride on a Yamaha Rhino. The driver made a turn and the Rhino tipped onto its passenger side. The unpadded rollbar landed on Ellie, killing her. An eyewitness reported to Ellie’s father John Sand that Ellie had her seat belt on at the time of the tipover. Following official investigations by agents of the State of Ohio, it was concluded that “There was no evidence the driver was reckless.”

5. Needless Hand Amputation Of Justin Miller From Tippy Rhino With No Hand And Arm Protection And Padless Roll Cage



Justin Miller suffered traumatic amputation of his left hand due to Yamaha Rhino's tippiness, directional instability, lack of Rhino driver hand and arm protection, and padless roll cage.

On May 26, 2008, California 16-year-old Justin Miller's life was changed forever. While on a camping trip in Northern California with family and friends, Miller took a ride on the family's new 2008 Yamaha Rhino 700, purchased with every available safety option. The brand new Rhino tipped over and landed on Miller's left wrist, severing his hand from his arm. Miller underwent painful replantation surgery at Stanford University Hospital to re-attach his hand. Despite the best efforts of the physicians, the replanted hand failed to thrive, and as a result Miller was forced to undergo additional surgery to amputate his left hand at the wrist.

Justin Miller was a licensed driver at the time of the rollover and had been safely driving ATVs for years. Even though he wore a helmet, was belted and driving prudently, the Rhino became uncontrollable and tipped over and his left arm was thrown out of the vehicle and his wrist crushed by the unpadded roll cage.

A Rhino full door and/or padded roll cage would likely have saved Justin's hand.

6. Needless Arm Amputation Of Sunny Katherine Chism From Tippy Doorless Rhino Without Door And With A Padless Roll Cage



Sunny Katherine Chism's arm was traumatically amputated by a doorless Yamaha Rhino on June 17, 2007, 10 weeks before all Rhinos ever made became eligible for free half-door retrofit.

Sunny Katherine Chrism is a bright and beautiful 13-year-old girl who attends junior high in Buna, Texas. She is the youngest daughter of loving parents, William and Melanie Chism. She is a spirited individual who loves volleyball, track, softball and basketball.

On June 17, 2007, Sunny's life was changed forever. While visiting family in Eudora, Arkansas, Sunny and her friend Kaitlyn Howard, also 13, went for a ride in a 2006 Yamaha Rhino 660. Sunny was driving along a dirt road by a beanfield in the early evening when the doorless Rhino rolled over, throwing Sunny from the vehicle and dragging her as it flipped over. Though gravely injured herself—her left arm was nearly severed and she was badly burned—Sunny managed to lift the overturned Yamaha Rhino off Kaitlyn, whose own shoulder had dislocated and left arm had broken in five places.

Sadly, on the following day Sunny's entire left arm was amputated. Her recovery process is slow and arduous; simple things we all take for granted have been difficult to master. Sunny has had to learn how to do everything with only one arm. While the initial trauma of the accident is over, Sunny continues to suffer phantom pain and mental distress. The quality of her

life and that of her family have been irreparably damaged, and Sunny's medical bills are a heavy financial burden on her family.

Despite the terrible loss of her arm and the trauma of the accident, Sunny remains a bright and beautiful young girl. She still loves to write and do art projects. Sunny is competing now on her school volleyball team. In September 2007, she was honored by her community and crowned "Queen for Life" at the Miss Sunny Golden Triangle Pageant. In February 2008 Sunny modeled with her prosthetic arm and won the Miss Teen Redbud Pageant. In May of 2008, Sunny broke ground by being the first amputee to enter the Miss Teen Texas Pageant where she placed third overall. Her perseverance is notable to all who are lucky enough to be in her presence.

A Rhino full door and/or padded rollbar would likely have saved Sunny Katherine's arm.

7. Billy James, Devoted Husband, Father And Avid Mississippi Outdoorsman, Had His Leg Severely Crushed By A Hazardous Yamaha Rhino. Yamaha's Door "Special Offer" Came Nine Weeks Too Late To Protect Mr. James. Tens Of Thousands Of Doorless Rhinos Remain In Use In The United States, Posing Similar Threats.

Billy James is the 46-year-old devoted husband of Martha and the loving father of their two children, Jason and Brittany. Billy's life was tragically and permanently altered on June 20, 2007, when he was maimed during the rollover of a doorless 2006 Yamaha Rhino.

At the time of the accident Billy was the belted driver operating prudently. The unpadded roll cage landed on his left leg, resulting in multiple crush fractures to his tibia and fibula, the consequences of which will be with him for the rest of his life. Billy has had to undergo seven surgeries as a result of his accident, and his leg will never be the same again. Unfortunately Billy's Rhino-related injuries are all too common—the tibia/fibula crush suffered by Billy is in many ways the Rhino's signature injury. Billy's leg would have been spared major

injury if Yamaha had taken appropriate safety measures by providing adequate containment (doors) and a padded roll cage necessary to protect occupants in rollovers.

A soft-spoken man, Billy is the type of person who receives satisfaction from being outdoors, working with his hands, and the value of a hard day's work. Because he can no longer stand for more than a few hours at a time, his responsibilities have shifted, and he spends most of each day behind a desk. Today, and every day, Billy is in constant pain, an endless reminder of the day his leg was crushed by a Yamaha Rhino.

8. What Is Static Stability Factor (SSF), Why Is It Important, and What Effect Does the Rhino's Extremely Low 0.88 SSF Have?

A. Strong Rollover Resistance Is Vital for Preserving Health and Safety

The deadly consequences of vehicle rollovers came to light in the 1980s, when a series of studies revealed that top-heavy vehicles experienced a disproportionate number of rollovers and fatalities. The influential Insurance Institute for Highway Safety (IIHS) reported in 1980 that unstable¹ utility vehicles were rolling over at five times the rate of passenger cars. Accident data from the National Highway Traffic Safety Administration (NHTSA) showed that death and disabling injuries were twice as high in unstable utility vehicles compared to passenger cars. In 2003, of the 281,000 vehicle rollovers, well over 10,000 resulted in fatalities and approximately 170,000 resulted in serious injuries.

According to the National Highway Traffic Safety Administration (NHTSA), "One of the primary means of assessing rollover risk is the static stability factor (SSF), a measurement of a vehicle's resistance to rollover."² According to NHTSA, static stability factor is a simple, easy, objective, repeatable and reliable way to determine a vehicle's resistance to rollover. SSF is also

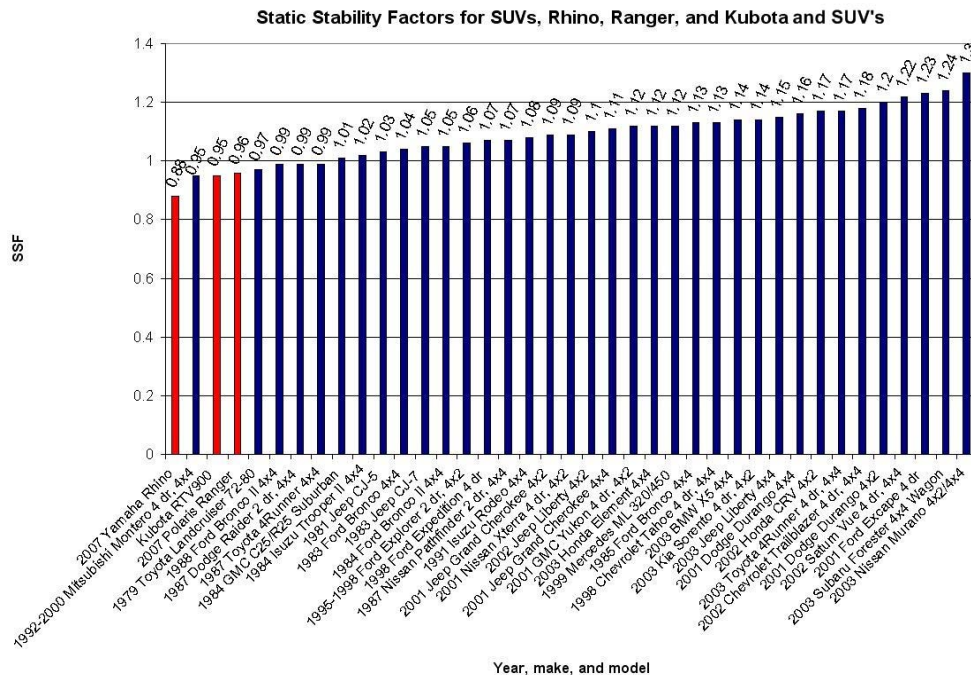
¹ Overly narrow track width and overly high center of gravity.

² <http://www.nhtsa.dot.gov/CARS/PROBLEMS/studies/NASRoll/PatNAS.ppt>

a measure that NHTSA has found that consumers can understand. SSF equals Track Width divided by two times the Height of the Center of Gravity Height. Vehicles with a high center of gravity are commonly referred to as “top-heavy.”

NHTSA determined static stability factor averages for model year 2003 automobiles. The average SSF for 2003 passenger cars is 1.41. It is 1.17 for SUVs; 1.18 for pickup trucks; 1.24 for minivans; and 1.12 for full size vans. Though UTVs such as the Yamaha Rhino might appear truck-like with their cargo bed, side-by-side seating, steering wheel, etc, they are very dangerous because they are extremely unstable, tippier than almost any other four wheeled vehicle ever made.

SSF of Rhino, Ranger and RTV9000 Plotted with SSFs of SUVs; The Rhino Is One of the Tippiest Vehicles Ever Sold



B. The Rhino’s 0.88 SSF Makes It One of the Tippiest 4-Wheeled Vehicles Ever Produced and Distributed

The 0.88 SSF for Yamaha Rhinos is one of the lowest SSF’s ever measured, 25% lower than the 1.18 average for 2003 pickup trucks. And unlike trucks, Yamaha Rhinos are sold

without a fully enclosed passenger compartment. This means that during a rollover, partial or total ejection and resulting catastrophic injuries and/or deaths are frequent. Consumers, unfortunately, are often unaware of UTV rollover and ejection hazards because UTVs offer a guise of safety created by seatbelts and roll cage.

Unlike trucks that travel mostly on smooth roads designed for safety, Rhinos are advertised for use on uneven terrain, where they are at highest risk of rollover. Resistance to rollover is easy to achieve with appropriate design and testing. Improving vehicle stability profoundly reduces morbidity and mortality.

Static Stability Factor values are such reliable predictors of rollover propensity that they form the basis for NHTSA's five-star rollover rating system. A static stability factor of 1.04 or less corresponds an alarmingly low one star rating, and a rollover risk of 40% or greater.

A static stability of 0.88, applicable to the Rhino, would equate to zero stars and virtually guarantees rollover under a great range of conditions.

9. The Rhino Can Easily Roll Over From Driver Steering Inputs At Low Lateral Acceleration Levels, As Low As 0.56 g's, Making The Rhino's Rollover Threshold Shockingly And Unacceptably Low

The Rhino's rollover threshold is shockingly and unacceptably low and can easily be exceeded during proper use of the Rhino. The directional instability of the Rhino combined with its rollover propensity and poor occupant containment make it unusually dangerous and unpredictable. Tippiness creates an exceptionally important need for maximum containment and maximum occupant protection.

Easily available alternative Rhino designs that Yamaha has unfortunately failed to yet adopt would eliminate the vehicle's directional and dynamic instability and vastly increase its resistance to rollover. For example, an alternative design – wider track width and rear

differential – would create substantial improvements in the rollover threshold of this vehicle as well as preventing rollover at lateral accelerations as high as 0.87 g's on concrete.

Design changes achieving greater Rhino stability would likely be far more effective than Yamaha's admonitions on its warning labels advising drivers against turning too sharply, which is essentially meaningless, since 'too sharply' is not defined. No information is provided to a Rhino driver concerning when 'too sharp' turn may occur or how it can be recognized and acted on prior to a rollover. This warning seems geared to making the user's behavior, rather than the manufacturer's design decisions, responsible for rollover injuries, while providing no useful information to the user.³

10. Containment: All UTVs Can And Should Meet Essential Minimum Containment Standards

The essential safety benefits of occupant containment in the vehicle rollover context have been well known for decades. Containment is particularly important for UTVs like the Yamaha Rhino that roll over so easily. The Yamaha Rhino has a history of major designed-in containment defects, a historic lack of adequate doors and/or other enclosures, that have literally caused hundreds of catastrophic injuries and dozens of deaths.

³ http://www.yamaha-motor.com/outdoor/Rhino_Owner_Info_807.aspx



Yamaha Rhino — No occupant containment protection offered until Yamaha announced a half-door retrofit on August 27, 2007 after hundreds of catastrophic leg and foot ejections, and catastrophic related crushes, fractures, amputations and dozens of deaths. Yamaha concedes that half of Rhinos remain without Yamaha’s retrofit doors.

This report also urgently requests that Yamaha, the off-road industry, ROHVA, NHTSA, and the CPSC all consider taking immediate measures, including interim steps, to protect the health, safety and lives of existing Yamaha Rhino riders.

Yamaha should formally recall all doorless Rhinos in order to help dramatically increase an unacceptably low current Rhino door retrofit compliance rate and should consider requiring full cab doors or nets or other containment devices necessary to protect Rhino occupants’ hands and arms.



Yamaha Rhino Half Doors. On and after August 27, 2007, Yamaha offered free half door retrofit for all Rhinos ever made because doorless Rhinos had injured and killed many riders. Even with these half doors, however, the Rhino remains a substantial product hazard because it is so unstable, offers no hand and arm protection for drivers, lacks a rear differential, has seat belts that fail to lock in rollovers, and presents other hazards discussed herein.

This report requests that Yamaha, the industry, manufacturers, ROHVA, NHTSA and/or the CPSC immediately disseminate effective notice, through a formal recall and multiple follow up mailings, to the entire population of current Yamaha Rhino owners and shops likely to sell or repair the vehicles, of Yamaha's free door retrofit program, and upgrade and thereby quickly expand the retrofit into a formal recall. Yamaha should also place paid advertising about the free door retrofit in UTV, ATV, dirt bike and off-road magazines.

To this day, many Rhino owners have not received notice of the retrofit. Other Rhino owners requested doors in response to the special offer and were denied doors because demand for doors exceeded supply. In other instances, Rhino owners are simply unaware of the dangers

of the Rhino, and therefore did not believe it necessary to have doors installed. This lack of retrofit compliance poses extraordinary risks to Rhino occupants' health and safety.

11. Further Rhino Recall And Consumer Retrofit Notice Measures Should Be Quickly Conducted To Address Low Yamaha Rhino Door Retrofit Compliance

On or about August 27, 2007, Yamaha entities announced a "Special Offer to Rhino Owners" for doors and passenger handholds to be retrofitted free of charge to "help keep occupants from sticking arms or legs outside of the vehicle in response to a side rollover."⁴

Yamaha Rhino retrofit compliance needs to be augmented with further consumer notification actions and/or formal recalls. Further notice and/or issuance of a formal recall are necessary to contain and protect Rhino occupants' feet and legs from ejection, crush, fracture, amputation and/or death in a rollover.

Yamaha's special offer is acknowledged by Yamaha to have successfully retrofitted only approximately 50% of an estimated 120,000 Rhinos sold in the United States. A formal recall such as the Firestone tire recall can see effectiveness of 97% or more.⁵ Formal recalls flag vehicles for automatic upgrades when they come to dealers for service, and formal recalls require follow on letters to consumers. In the Rhino's case, Yamaha only did a single letter to consumers in which they describe merely a "special offer." Yamaha never formally recalled the Rhino and never sent follow up letters to non-compliant owners.

NHTSA issued emergency new Ford recall warnings in 2008 after discovering an unacceptably low 50% retrofit compliance rate relating to fires caused by millions of Ford car and trucks with defective switches. *See* February 28, 2008 NHTSA Consumer Advisory.⁶

⁴ http://www.yamaha-motor.com/outdoor/Rhino_Owner_Info_807.aspx.

⁵ http://findarticles.com/p/articles/mi_m0EIN/is_ai_75822986

⁶ NHTSA warns Ford, Lincoln and Mercury Owners of Fire Hazards Involving Faulty Cruise Control Switches in Recalled Vehicles That Have Not Been Repaired, Owners of Recalled Vehicles Are Urged to Bring Vehicles to

Footnote continued on next page

[“NHTSA is issuing the consumer advisory due to concerns that many owners have yet to respond to multiple safety defect recall notifications involving approximately 9.6 million registered vehicles. Approximately five million vehicles have been repaired so far, leaving some five million passenger cars and light trucks with the faulty switches intact, and in danger of catching fire.”].⁷

The Rhino’s estimated 50% present retrofit compliance is similarly inadequate and unacceptable. The compliance gaps justify and cry out for immediate recall and emergency new consumer notices by CPSC and/or Yamaha.

The Yamaha Rhino half-door should also be upgraded to a full door and/or should be augmented with netting, because Rhino half-doors fail to protect occupant’s hands and arms and are too low to always protect feet and legs.

This report contends that full doors, which were never included on the Rhino, would likely have prevented most, if not all, of the injuries and deaths resulting from Rhino rollover incidents and should be required equipment on the rollover-prone and directionally unstable Yamaha Rhino.

A. DeHaven’s Packaging Principles And Related Safety Value Of Occupant Containment Have Been Known For Decades

In 1952, Hugh DeHaven, who is often referred to as the “Father of Crashworthiness Research,” wrote his seminal paper on automobile protection concluding that human bodies could withstand forces of severe crashes without serious injury or death if they were properly

Footnote continued from previous page

Dealers Immediately to Disconnect Faulty Switches. *See*

http://www.nhtsa.dot.gov/portal/site/nhtsa/template.MAXIMIZE/menuitem.f2217bee37fb302f6d7c121046108a0c/?javax.portlet.tpst=1e51531b2220b0f8ea14201046108a0c_ws_MX&javax.portlet.prp_1e51531b2220b0f8ea14201046108a0c_viewID=detail_view&itemID=067c4b7cc9c58110VgnVCM1000002fd17898RCRD&pressReleaseYearSelect=2008

⁷ *See also:* http://www.ford.com/dynamic/metatags/article-detail/223_important_notice_voluntary_recall_update

packaged. Mr. DeHaven's packaging principles are equally important in the UTV context and would provide as follows:

1. Package must not open up or spill its contents and must not collapse under reasonable or expected conditions of force that expose occupants inside to injury;
2. Packaging structures which shield the inner container must not be made of brittle or frail materials, they must resist force by yielding and absorbing energy;
3. Articles inside the package should be held and immobilized inside the structure; and
4. Restraint of an object inside a package must be achieved by transmitting forces to the strongest parts of the packaged object.⁸

Unfortunately, Yamaha and the government agency charged with protecting consumers—the Consumer Product Safety Commission (CPSC)—have not done enough to protect UTV occupants. As a result, hundreds of Yamaha Rhino occupants, including many fully belted occupants, have been seriously injured or killed when they are violently crushed in a rollover.

The need for containment in the UTV vehicle class is especially acute because many of these vehicles are extremely unstable yet are promoted for aggressive high-speed, off-road sports use. Many UTVs, particularly the Yamaha Rhino, have demonstrated a propensity to tip-over and/or rollover at extremely low speeds without warning to the vehicle's occupants. This propensity to tip-over and/or rollover, combined with the lack of adequate occupant containment

⁸ See *Crash Study Can Reduce Chances of Injury*, DeHaven, H. (June 17, 1952), *Public Safety*, Vol. 41, No. 6, pp. 8-9, cont'd on pp. 28-29. [To protect the occupant, the vehicle or package must not "spill its contents."]; see also "Accident Survival – Airplane and Passenger Automobile," pp. 562-568 in Haddon W. Suchman ECA, Klein, D: *Accident Research. Methods and Approaches* (1964).

features, has resulted in terrible major injuries including severe crushes, fractures, amputations, acute compartment syndrome, and/or death.

By fully containing the occupant in the rollover, the chances of surviving a UTV tip-over/rollover without major injury are vastly improved, making basic containment testing and standards crucial for health and safety.

All UTV vehicles can and should be required to contain the occupants in tip-over and rollover situations. Similarly, all UTVs can and should be required to meet basic containment tests for legs, arms, feet, hands and heads.

Standard vehicle rollover testing is necessary for all UTVs, though many UTV manufacturers have flagrantly and consciously refused to perform adequate occupant rollover testing. Lateral tilt table simulation testing with mannequins is already conducted for all forms of road-ready automobiles. Lateral tilt table testing, with specific standards and requirements, must be instituted for UTV vehicles as well.

The rollover test prong of Federal Motor Vehicle Safety Standard (FMVSS) 208, allows automobiles to be tested in 30 mph dolly rollover conditions to demonstrate that all portions of a test dummy are contained within the outer surfaces of the vehicle passenger compartment in the rollover. The same can and should be mandated for UTVs.

12. UTV Safety Envelope Is Critically Important And Must Be Maintained

The safety envelope of UTV must be considered and protected. UTV safety can be enhanced through supplementary restraints like doors, preventing excursion of the feet/legs, hands/arms, and torso. This can be easily accomplished by partial—and better yet—full cab doors, roll cage padding and netting and by using well designed seat belts.

The half door retrofit “Special Offer,” initiated by Yamaha in August of 2007, has prevented some catastrophic leg and foot injuries, but the half door still allows hands and arms

and sometimes even legs to be ejected and crushed. Further, the retrofit compliance rate is insufficient because of inadequate notice and availability. As a result, an unacceptable level of leg, feet, hand, arm and head injuries continues to occur.

Upgrading the Rhino retrofit to include full doors and/or hand and arm netting would much improve Rhino safety and prevent many future injuries and deaths.

One UTV design with a safety envelope superior to the Rhino is the Honda Big Red which comes factory equipped with full hand and arm protection netting as well as foot and leg protection.⁹



Honda Big Red — Equipped with hand, arm, leg and foot protection.

Similarly, some off road outfitters have been retrofitting the Yamaha Rhino with full doors in order to better contain and protect passengers. *See* Dirt Wheels magazine, *Baja VTV Tours*, April 2008, pp. 78-84.

⁹ *See e.g.*, <http://powersports.honda.com/2009/big-red/innovations.aspx> and 2009 Honda Big Red brochure.



**Baja UTV Tours Outfitter (800-903-1098) –
Full cab doors with polycarbonate windows retrofitted on Rhino.**

Another UTV design with a superior safety envelope to the Rhino is the Polaris RZR, which includes hand, arm, leg and foot protection, as seen below.



Polaris RZR — Equipped with torso, leg, foot, hand and arm net protection.

Equipping Rhinos with full “cab doors,” as Yamaha contemplated pre-production, would do much to provide vital hand and arm protection.



New Model Year 2009 Arctic Cat Prowler 1000, and full cab door option. Unfortunately, the full cab door is not standard and needs to be stronger. Also, it is currently marketed as a “weather” option, not a safety option.

13. Seat Belt Restraints: All UTVs Can And Should Be Equipped With Seat Belt Restraints That Fully Conform To Federal Motor Vehicle Safety Standard (FMVSS) Standards

FMVSS seat belt standards for automobiles are reasonable minimum standards for safety that all UTVs can and should follow.

Former FMVSS 209, adopted in 1967 and withdrawn and replaced in 2001 by new seatbelt standards, required that passenger cars’ seat belt assemblies “shall provide pelvic restraint whether or not upper torso restraint is provided, and the pelvic restraint shall be designed to remain on the pelvis under all conditions, including collision or roll-over of the

motor vehicle.”¹⁰ FMVSS 209 also required adjustability of lap belt to fit range of occupants. Both of these provisions are excellent model standards worth requiring for UTVs too.

The current Yamaha Rhino seat belts are inadequate for several reasons, including failure to properly restrain small adults and children snugly in the pelvis area; the Rhino’s seatbelt receiver stalk is too high, and too far away from the seat and pelvis. Yamaha itself has admitted that they neither designed nor tested Rhino seat belts to ensure that they kept occupants stable in a rollover.

The National Highway Traffic Safety Administration (NHTSA) has recognized the need for belts to properly fit smaller adults and children and requires that seats other than the driver’s seat have belts that fit a range from a 6-year-old child to a 95th-percentile adult male.¹¹

Seat belt engagement alarm and/or ignition lock switches are cheap, widely available components that would practicably and measurably increase UTV seat belt usage. Their use can be widely adopted and mandated.

14. All UTVs Should Have Four Or Five Point Harnesses And/Or Three Point Automobile Style Seat Belt Restraints With Emergency Locking Retractors (ELR) That Are Sensitive To Vehicle Angle As Well As Vehicle Or Webbing Acceleration

All UTVs, particularly those marketed for sports use, should have four or five point harnesses and/or those with three point harnesses should have seat belt restraints with emergency locking retractors (ELRs) that are sensitive to vehicle angle as well as vehicle acceleration because vehicle angle sensors are necessary to prevent belt spool out in low speed tip-overs/rollovers that frequently occur in the off-road environment.

¹⁰ National Highway Traffic Safety Administration, Department of Transportation, 49 CFR Ch. V (10-1-97 Edition) Section 571.209 Standard No. 209, Seat Belt Assemblies.

¹¹ National Highway Traffic Safety Administration, Preliminary Regulatory Evaluation ANPRM on Improved Design for Safety Belts (FMVSS 208), May 1992.

Webbing sensitive-only retractors do not provide adequate restraint in tip-over or rollover accidents. This is especially true in low-speed tip-over/rollover events, because the decelerations are insufficient to cause locking of webbing sensitive retractors. All contemporary cars contain seatbelts with emergency locking retractors and angle locking retractors. It is essential that UTVs incorporate these seatbelt safety measures in order to sufficiently restrain occupants. As well, there should be consideration for including additional anti-slack and anti-spool out features.

Thomas, *et al.* of Thomas Engineering state in a 2002 paper that “we are not aware of any mainstream production retractors in use in the United States that are webbing-sensitive-only ELR’s.”¹²

The Yamaha Rhino was produced with a webbing-sensitive-only ELR. This retractor greatly increases the danger of a partial ejection by a belted occupant during a rollover. This is why the Yamaha Rhino seat belt fails to keep occupants stable in a rollover and is one of the major reasons for the Yamaha Rhino’s unreasonably high morbidity and mortality rates in rollover setting.

The Polaris RZR, on the other hand, has a retractor that locks at vehicle angles greater than 15 degrees, significantly enhancing protection of vehicle occupants in rollovers.

¹² T. Thomas, M. Marine, J. Wirth, B. Peters, Emergency-Locking Retractor Performance in Rollover Accidents, IMECE2002-39101, ASME, 2002.



Polaris RZR Seat Belt Instructions [discussing how the Polaris RZR belts locks automatically at 15 degrees or higher lateral angles].

A typical retractor with a pendulum for sensing vehicle acceleration and angle will typically move to a locked position due to lateral accelerations on the vehicle before motion of the occupant can begin to spool the webbing out in a loss of control situation.

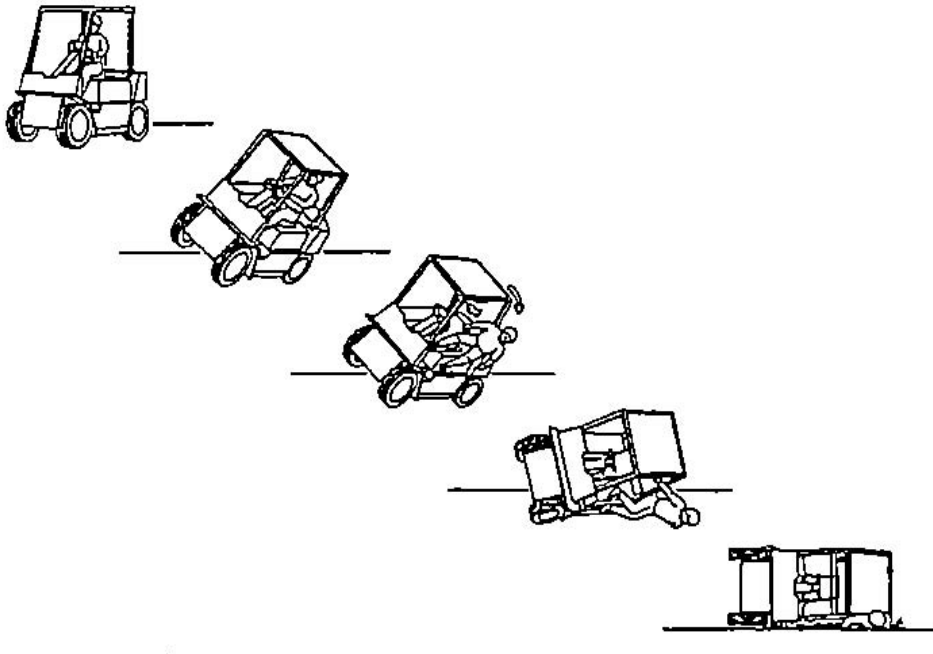
Spool out of the belt from the retractor as a result of the lack of a pendulum sensor vastly increases the likelihood of partial ejection, major injury, crush, fracture, amputation and death in rollovers.

15. Roll Cages On UTVs Must Be Padded And Must Be Designed To Be Shaped To Protect Occupants, Not Kill, Maim, Fracture Or Crush Them

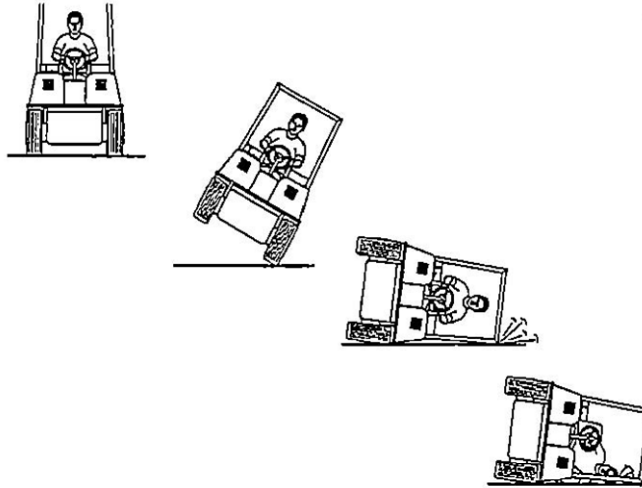
The UTV roll cage/seat belt system must be designed in such a way as not to increase the likelihood of the mouse-trap or fly swatter effect, whereby the occupant can be crushed between the roll cage and the ground during a rollover and/or launched into the ground or roll cage when

the rollover is suddenly arrested by the roll cage but the occupant keeps going due to seat belt spool out and/or centrifugal force.

Mousetrap Effect: The mousetrap effect occurs where roll cage maims, crushes, fractures and/or kills occupants not fully contained in rollover, and was predicted in a 1994 SAE published paper. Yamaha Rhinos have “mousetrapped,” maimed, injured and/or killed hundreds of innocent riders across the country, provoking a half door free retrofit program that Yamaha concedes has only been 50% effective.



Fly-swatter Effect: The fly-swatter effect is where roll cage stops vehicle abruptly and occupant is catapulted into ground when and if their seat belt fails to keep them fully in their seat, foreseen in 1994 SAE published paper. Rhino seat belts unfortunately fail to include pendulum locks, thereby failing to lock in most rollover situations.



The Yamaha Rhino roll cage is unpadded and unnecessarily flat on its side, which maximizes, instead of minimizes, the likelihood that it will strike and crush occupants in a tip-over/rollover.

Acceptable re-designs of the Yamaha Rhino would be to pad it and to move the protective structure away from the occupants and design it such that there are minimal crush points for occupant appendages between the cage and ground. This can be accomplished by creating a protrusion of one part of the roll cage resulting in only one crush location and not designing the cage as a flat plane with many crush points, as the Rhino is designed now.

16. Rollbar Padding Is Essential To Protect Rhino Occupants

UTV rollcages should be padded. Effective roll cage safety padding is available retail for approximately \$1 per foot. The cost for padding on UTV roll cages would likely be pennies per foot and it is feasible that an entire UTV's roll cage could be properly padded for well under \$5.

Dense foam pads readily protect against fatal head blows and crushing, acute compartment syndrome and fracture injuries to legs and arms.¹³

Unpadded UTV roll cages pose dramatic threats to life and safety in a wide variety of collision, tip-over and rollover modes. Properly designed energy-absorbing padding, such as that used in race cars, is a simple and cost-effective alteration that would provide enormous additional occupant protection.

In 1979, the Insurance Institute for Highway Safety (IIHS) identified the need for head impact protection in interior areas. In 1980, General Motors developed a free motion headform (FMH) test device for head impact testing of vehicle interior surfaces. In 1980, Saab then introduced padded “A” pillars, padded roofs, and a padded steering wheel hub on its vehicles.

In 1985, the NHTSA initiated free motion headform (FMH) impact testing at its Transportation Research Center (TRC) in Ohio. This included FMH impact into vehicle interiors with one inch of padding at speeds up to 25 miles per hour (mph). In 1988, Saab introduced padded roofs and padded “A” pillars on its Saab 9000 model.

In 1993, NHTSA issued a Notice Of Proposed Rulemaking (NPRM) to substantially upgrade the Federal Head Impact Standard, FMVSS 201, by including numerous other interior areas to be tested with free motion headforms. In 1995 the NHTSA issued its final rule substantially upgrading FMVSS 201 rules on interior padding. This included required testing and performance standards for all interior head impact areas, including the roof supporting structures and components, including all roll bars.

¹³ See, e.g., Head injury reduction with roll bar padding, Khadilkar, A.; Sances, A., Jr.; Herbst, B.; Forrest, S.; Meyer, S. Engineering in Medicine and Biology, 1999. 21st Annual Conf. and the 1999 Annual Fall Meeting of the Biomedical Engineering Soc. BMES/EMBS Conference, 1999, Proceedings of the First Joint Volume 1, Issue, 1999 Page(s):504 vol. 1 – Digital Object Identifier 10.1109/IEMBS.1999.802582 [Potential injury mitigation of padding on vehicular roll bars was evaluated. After-market and metal air gap padding markedly reduced the head injury criterion (HIC) angular acceleration and angular velocity].

To implement a substantially upgraded FMVSS 201, NHTSA hosted a Society of Automotive Engineers Toptec Seminar on Head Impact Protection under the newly proposed FMVSS 201. This Head Impact Protection Seminar in Novi, Michigan was attended by over 300 transportation industry engineers and engineering management. Just prior to the SAE Toptec Seminar, NHTSA issued a press release projected that new FMVSS 201 would save 1,200 lives and avoid 975 catastrophic head injuries a year. There was no transportation industry opposition to the NHTSA's newly proposed FMVSS 201.

Following the issuance of the new FMVSS 201, the child seat industry, which was not directly regulated under the new FMVSS 201, began to install impact friendly interiors to its infant seats and child seats, generally in the form of a padded or Styrofoam inner shell padding for these seats. In 1998, Britax and other infant seat manufacturers began to produce their infant and child seats with head impact friendly Styrofoam seat shells. In 1999, NHTSA started hosting workshops with the child seat industry regarding a possible new child seat rule, under FMVSS 213, to require more energy absorbing padding materials on child seat to mitigate child head impacts to the wings and rear shell of the child seat during a vehicle impact.

Jeep Wrangler roll bars have long been padded under FMVSS 201 for head impact protection.

2003 – 2006 JEEP WRANGLER TJ ROLL BAR PADDING



A complete set of original rollbar foam padding and the zippered cloth covers from inside a 2006 Jeep Wrangler.

The benefits of padding interior surfaces have been well recognized by not only the federal government but all major automobile manufacturers since the 1960s. “Friendly interiors” required padding of all surfaces reasonably foreseen to be potentially contacted by occupants during typical crash modes, including upper and lower surfaces and any area that potentially comes into contact with occupants in foreseeable situations. *See, e.g.*, Federal Motor Vehicle Safety Standard (FMVSS) 201.

Jeep Wrangler roll bars have been padded since 1995 because of a rash of major leg and head injuries and deaths in Jeep rollovers and Yamaha Rhino roll bars should all be padded for the same reason..

17. Stability And Handling Standards, Including Minimum Resistance To Rollover, Will Substantially Reduce UTV Tip-Overs/Rollovers And Related Major Injuries, Fractures, Disabilities And Deaths

Just as NHTSA requires dissemination of SUV rollover risk data to consumers, UTV manufacturers can and should disseminate UTV rollover risk data in the form of Static Stability Factor (SSF) data for UTVs.¹⁴

18. Requiring Minimum UTV SSF Of 1.0 Would Dramatically Lessen the Incidences of UTV Rollovers

Requiring minimum UTV SSF's of 1.0, ideally measured while the UTV is occupied with a 200 lb driver and passenger, would do much to improve UTV safety.

Any UTV can significantly improve its SSF by lowering the center of gravity and/or by expanding the track width. A more stable center of gravity can be achieved by simply lowering rider seat positions and reducing vehicle clearance heights. Expanded track width can be easily achieved with wider axles and/or through installation of wheel spacers. It is essential that Yamaha addresses the Rhino's dangerously low SSF in order to save lives of riders.

¹⁴ See National Research Council (U.S.), Committee for the Study of a Motor Vehicle Rollover Rating System. "The National Highway Traffic Safety Administration's Rating System for Rollover Resistance : An Assessment / Committee for the Study of a Motor Vehicle Rollover Rating System." (Special report ; 265), Transportation Research Board, National Research Council.

On the other hand, vehicles with a high center of gravity and a narrow stance have a low static stability factor. The 1988 Bronco II has a static stability factor of 0.99. Rollover testing of this vehicle has shown it to be very unstable.



The static stability factor can also indicate the stability of other objects such as chairs and stool seats. A stool is much more “tippy” than an easy-chair. The static stability factor predicts this with the stool having a much lower static stability factor.

Static Stability Factor can also indicate the stability of other objects such as chairs and stool seats. A stool is much more “tippy” than an easy-chair. The static stability factor predicts this with the stool having a much lower static stability factor, 0.81, than the lounge chair, 1.12.

19. For Dynamic Performance, Basic Dynamic And Directional Safety Standards Can And Should Be Adopted: UTV Vehicles Should Be Required To Demonstrate In Testing That They Do Not Rollover On A Flat, Level Surface Through Steering Inputs Alone

UTV vehicles should be required to demonstrate in testing that they do not rollover on a flat, level surface through steering inputs alone.

UTV, ATV and automobile manufacturers have known for decades that maintaining control and reducing propensity for tip-over/rollover means avoiding oversteer, because the oversteer condition is exceptionally hard for lay and professional drivers alike to recover control from. It is usually most desirable to have the car adjusted for a small amount of understeer, so that it responds predictably to a turn of the steering wheel and the rear wheels have a smaller slip angle than the front wheels.

Understeer is more predictable and controllable than oversteer. Therefore, the handling and stability of the UTV vehicle should be required to be neutral and/or to understeer throughout when tested on a 100 ft. diameter circle with SAE J266 as the guideline.¹⁵

20. Dynamic Testing Of The Standard Configuration Yamaha Rhino Reveals It To Be Directionally Unstable, Characterized By A Transition To Severe Oversteer At Lateral Accelerations As Low As 0.25 To 0.3 g's. Vehicles Like The Yamaha Rhino That Transition From Understeer To Oversteer Are Exceptionally Unpredictable And Difficult To Control

Dynamic testing of the standard configuration Yamaha Rhino reveals it to be directionally unstable, characterized by a transition to severe oversteer at lateral accelerations as low as 0.25 to 0.3 g's.

¹⁵ Consumer Product Safety Commission, All-Terrain Vehicles (ATVs) Project Status Report February 2008, 2008. <http://www.cpsc.gov/library/foia/foia08/brief/ATVProjectStatusReport.pdf> (page 48).

21. When Two Modifications Are Made – Widening The Track Width And Adding A Rear Differential – The Rhino’s Resistance To Rollover And Directional Stability Both Improve Tremendously

A differential allows the inside and outside tires to turn at different speeds which eliminates the need for the Rhino’s rear anti-sway bar whose purpose is to lift the inside rear wheel in a turn but which also thereby initiates and dramatically increases the likelihood of tip-over and rollover.

The Yamaha Rhino’s rear anti-sway bar is better called an anti-stability bar, because it induces, initiates and encourages rollover, and should be eliminated promptly. Indeed, equipping a quad with an anti-sway bar in the rear alone is contrary to well accepted vehicle engineering guidelines. For example, *The Society of Automotive Engineers Manual on design and manufacture of Torsion Bar Springs and Stabilizer Bars, 2000 Edition, HS-796* warning against a rear-only stabilizer bar; states:

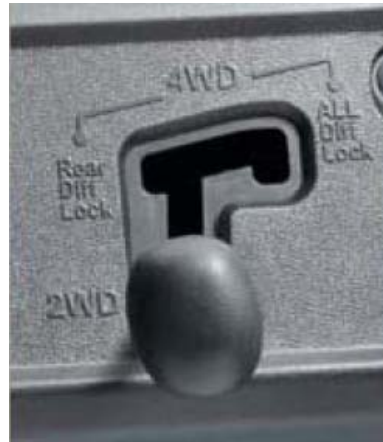
Stabilizer bars are generally installed on both front and rear suspensions or in front suspension only. **Use of a stabilizer bar on the rear suspension only can sometimes have an adverse effect on vehicle handling.** Such installations should be tested under severe cornering conditions to ensure the desired handling characteristics.

Id. (Emphasis added). The rear-only Rhino anti-sway bar makes the vehicle extraordinarily unstable because when the anti-sway bar lifts the inside rear tire, it leads to immediate directional instability (oversteer), dramatically increasing chances of rollover.

The Rhino’s front differential is easily mounted on the rear. The rear differential would eliminate the need for a rear-only anti-sway bar, vastly improving the Rhino’s directional and dynamic stability.

Widening of the Rhino track-width also adds much static and dynamic stability to the Rhino and can be easily accomplished through axle width changes and/or post-sale by adding 4 inch aluminum spacers at each wheel.¹⁶

Many competitor UTV vehicles already include rear differentials, such as the Honda Big Red, Polaris RZR and Kawasaki Mule.¹⁷



Honda Big Red, with Rear Differential

Similarly, the 2009 Arctic Cat Prowler 1000 XTZ951cc UTV vehicle includes rear “turf saver” differential that much improves vehicle stability.¹⁸

Three significant safety upgrades—rear differential, shoulder belts and full cab door option – appear to have been made to the Arctic Cat Prowler 1000 prior to commercial Prowler sales. These upgrades were made following criticisms by trade magazine test drivers of Prowler 1000 prototype vehicles. Off-Road.com said of the Prowler prototype, “What we don’t like. Lack of safety features. No leg protection and only lap seatbelts.”¹⁹

¹⁶ See <http://rhinogiant.com/rh1biwhsp2.html>.

¹⁷ See <http://powersports.honda.com/2009/big-red/innovations.aspx> and Honda Big Red 2009 Product Guide.

¹⁸ <http://assets.arcticcat.com/atv/pdf/catalog/ProwlerBroUS.pdf>

¹⁹ Off-Road.com Exclusive: 2009 Arctic Cat Prowler 1000 XTZ951cc of pure Minnesota muscle, by Stephen Clark, Sep 15, 2008; see also: http://www.utvguide.net/utv_comparison.htm, 2009 Sport UTV Comparison Chart [criticizing multiple vehicles for lack of unlocking rear differential Polaris RZR 800, Polaris RZR S, Yamaha Rhino

Footnote continued on next page

Regarding the Rhino, Yamaha, simply refused to act for almost two years following similar criticisms in trade publications. *Sand Addiction Magazine* wrote in 2005, “We would be concerned with the strength of the roll bar and the openness in the [Rhino] doorway. In a rollover, it would be human nature to try to stop the rollover by sticking your foot out. In stock form, there is nothing to prevent you from doing this.”²⁰

22. The Yamaha Rhino’s Lack Of Rear Differential And Resulting Directional Instability And Excessive Susceptibility To Rollover Is Exacerbated By A Hazardous Single Rear Brake Setup On Many Rhinos.

Unlike other vehicles, such as the John Deere UTV and the Arctic Cat Prowler 1000, many Yamaha Rhinos lack dual rear brakes.²¹

While all Rhinos appear to have front disk brakes, many Rhinos use only a single disk rear brake smaller than those on the front on the driveline. This single brake slows down both rear wheels at the same time. This design increases profits because it avoids the cost of including brake lines out to the rear wheels, avoids the cost of mounting brakes outboard, and conserves funds by utilizing only one brake caliper, brake pad, and rotor, rather than two. The trade off is reduced stability while braking—yet another substantial product hazard posed by Rhinos.

The lack of dual rear brakes on many Rhinos is believed to contribute to the vehicle’s extraordinary directional instability and difficulty or impossibility of controlling the vehicle while braking. A single rear axle or driveline brake is normally only found on golf carts and

Footnote continued from previous page

700, Kawasaki Teryx 750 and [prototype] Arctic Cat Prowler 1000.]

²⁰ Yamaha Rhino Review - A 2006 Special Edition Yamaha Rhino, December 2005 Sand Addiction Magazine (www.duneguide.com).

²¹ See, e.g., <http://www.yamaha-motor.com/outdoor/products/modelspecs/441/0/specs.aspx> [describing single rear brake set up of the 2009 model year Rhino 450]; see also <http://www.yamaha-motor.com/outdoor/products/modelspecs/592/0/specs.aspx> [describing dual rear brakes on the Yamaha Rhino 700 Special Edition].

other electric low speed utility vehicles. Manufacturers which make a vehicle capable of significant speeds typically use dual rear brakes. Using only a single, smaller, rotor and caliper in the rear results in significant imbalance in braking.

23. Proposal For Minimum Lateral Tilt Angle Standard: UTVs Should Be Able To Reach A Lateral Tilt Angle Of At Least 45 Degrees Prior To Their Outside Tires Lifting

In order to more easily evaluate the lateral stability of a range of vehicles and implement a tilt standard not based on mathematical formulae, a minimum lateral tilt angle can be specified, under and up to which there is no lift of the trailing side tires.

The Society of Automotive Engineers J2258 Surface Vehicle Standard for Light Utility Vehicles provides recommendations for the test platform in Section 7.8.1.a, recommending that the test surface have a minimum coefficient of friction of 1.0. In addition, it is recommended that the leading edge of the table have a small raised lip of 0.5 to 1” to restrain the leading side tires and not allow the vehicle to slide on the platform at higher angles.

Prior to testing, the tires should be set to the recommended cold pressure, and the vehicle suspension should be checked to be at its neutral position for the loading configuration. In conjunction with the fact that the addition of driver and passenger greatly decreases the lateral stability; it is currently our recommendation that vehicle be tested with the addition of 166 lbs in the driver and passenger seating positions.²² The seat loads can be water dummies, ATD dummies, or each seat can be loaded according to SAEJ2258 Section 7.8.1.e.

With the current generation of UTVs, and in particular the Yamaha Rhino a 45 degree critical tilt angle minimum standard is appropriate. This corresponds to a critical lateral

²² HIII 50th Percentile Male weight, see <http://www.dentonatd.com/dentonatd/pdf/FAAHIII50MA.PDF>.

acceleration of 1.0 g's. Alternatively, this angle would equate to a static stability factor which accounts for suspension and tire deflections of 1.0 g's.

Lateral tilt table comparisons of popular UTVs show that the Yamaha Rhino is extremely tippy, just like its extremely low SSF demonstrates extreme tippiness and just as has been demonstrated by hundreds of catastrophic Rhino rollover accidents injuries and dozens of deaths.

Static Lateral Tilt Table Stability Values for Some UTVs

Vehicle	2005 Yamaha Rhino 660 (Stock)	2005 Yamaha Rhino 660 (6" Wider Track)	2000 Kawasaki Mule 2500	2001 Kubota RTV900	2007 Polaris Ranger 700	2003 Yamaha G22A Golf car
Tip Angle (Vehicle Only)	37.90	43.20	45.30	41.60	40.90	48.0
Tip Angle (With 200# Operator)	33.40	38.50	39.50	38.80	35.30	35.80

24. Why Are Safety Performance Standards For UTV's And Rhino Recall Efforts Urgently Needed and Vitally Important? Because Yamaha Rhino Rollover Outcomes Include Countless Severe, Often Irreparable Complex Fractures And Other Catastrophic Injuries And Dozens Of Deaths

Comminuted and compound fractures are two injuries frequently seen in Yamaha Rhino rollover situations. In comminuted fractures, bone is crushed and splinters into numerous small fragments. These fractures are among the most difficult to treat, and are often too unstable for a cast to maintain alignment. Comminuted fractures often result in 'nonunion' of the fracture, even after grueling and complicated surgical interventions, and may require bone-grafting, which is an extremely painful and debilitating procedure where native bone is harvested from the injured patient's pelvis.

Compound fracture describes a break that is so high-impact and severe that a fragment of the bone protrudes through the skin at the site of the injury. Many Rhino rollover survivors have

also endured the extreme pain associated with compound fractures, as well as the serious and deep tissue infections that often accompany these open fractures, sometimes permeating all the way to the bone itself and requiring months of intensive intravenous antibiotic therapy.

The Lisfranc fracture is also a common Rhino injury. It is a severe and painful fracture and dislocation of the joints in the midfoot, where a cluster of small bones forms an arch on top of the foot between the ankle and the toes. Midfoot fractures, particularly fracture dislocation injuries, effect the function of the entire foot in the long-term outcome. Most Lisfranc fractures require painful open reduction and operative fixation. This severe injury carries a high incidence of chronic pain, arthritis and disability.

25. Numerous Major Instances Of Compartment Syndrome Have Also Resulted From Yamaha Rhinos

Acute Compartment Syndrome is a medical emergency typically caused by a traumatic bone crushing injury such as has frequently occurred when a doorless Rhino tips over and crushes the leg and/or foot of the rider. It is an extremely painful and potentially life-threatening condition occurring when pressure from bleeding or swelling within the muscles builds to dangerous levels, causing lack of oxygen and nourishment to the blood vessels, nerves and muscle cells with subsequent permanent disability or even death. Treatment involves painful surgical fasciotomies to cut open the skin and fascia covering the affected compartment, thus reducing the pressure. Surgical repair of the fasciotomies is done only after the swelling recedes, and skin grafting may be needed. Without treatment, Acute Compartment Syndrome leads to paralysis, loss of limb or death. When a Yamaha Rhino rolls over, often the occupants' legs, feet, hands and arms come out of the vehicle due to centrifugal force and are crushed and destroyed. With a dry weight of up 1,140 pounds, the vehicle can cause injuries so severe that

they necessitate, as in Miller's case, amputation of the limb. If the limb can be saved, the injured person may have to endure multiple surgeries and usually is left with a permanent disability.

Conclusion

This report suggests a vital need for UTV manufacturers, their trade group, the Recreational Off Highway Vehicle Association ("ROHVA"), the National Highway Transportation Safety Administration ("NHTSA") and/or the Consumer Product Safety Commission ("CPSC") to adopt rigorous minimum mandated UTV safety standards and minimum mandated performance standards, including minimum occupant containment, stability and seat belt standards.

Mandatory UTV safety and performance standards proposed here should not be construed to relieve manufacturers, promoters or sellers of their common law responsibility to make safe products and should not preempt injured consumers' rights to pursue civil claims for injuries and/or deaths.

An already unacceptably high Yamaha Rhino casualty rate will continue absent swift action on minimum side-by-side safety standards, minimum performance standards and urgent action and/or recalls on Yamaha Rhino safety and door retrofit compliance. Prompt adoption of reasonable measures proposed here would dramatically and immediately improve upon UTV/UTV class safety in general and the safety of Yamaha Rhinos in particular.

Respectfully Submitted By:

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Michael Roberts, Graydon Head & Ritchey LLP, On Behalf of John and Tammie Sand;

Center for Auto Safety; and

Trauma Foundation.

UTV/Rhino injuries and deaths should be promptly reported to CPSC and Yamaha entities.

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Don Friedman, consulting Safety Design Engineer: (805) 683-6835

J.T. Crow, age 9, killed by Yamaha Rhino tipover, died on 6/22/07



Abbey West, age 13, killed by Yamaha Rhino tipover, died on 11/23/06



**Whitney Bland, age 13, killed by
Yamaha Rhino tipover, died on 5/22/07**



**Sydney Anderson, age 10, killed by
Yamaha Rhino tipover, died on 11/22/06**



**Stephanie Katin, age 26, killed by
Yamaha Rhino tipover, died on 2/23/08**



**Dani Bernard, age 18, killed by Yamaha
Rhino tipover, died on 11/26/06**



**Ashlyn Vargas, age 12, killed by
Yamaha Rhino tipover, died on 11/29/07**



**Dusty Lockabey, age 14, killed by
Yamaha Rhino tipover, died on 8/07/07**



**Kristin Lake, age 11, killed by Yamaha
Rhino tipover, died on 5/29/06**



**Ellie Sand, age 10, killed by Yamaha
Rhino tipover, died on 10/28/07**



**Lauren Dilworth, age 11, killed by
Yamaha Rhino tipover, died on 10/18/08**



**Emily Bates, age 11, killed by Yamaha
Rhino tipover, died on 10/18/08**



**Eddie Ray, age 13, killed by Yamaha
Rhino tipover, died on 9/13/07**



**Karen Harwood, age 46, killed by
Yamaha Rhino tipover, died on 9/10/05**



Emily King, age 20, killed by Yamaha
Rhino tipover, died on 4/14/07



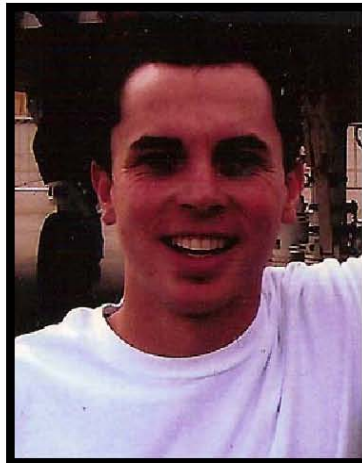
Wyatt Bauer, age 13, killed by Yamaha
Rhino tipover, died on 7/28/07



Andrew Bahl, age 3, killed by Yamaha
Rhino tipover, died on 8/24/08



David Morgan, age 21, killed by
Yamaha Rhino tipover, died on 2/22/08



At least 38 Yamaha RHINO rollover deaths reported so far to Heidi Crow and/or CPSC

DATE OF RHINO ROLLOVER DEATH	DECEDENT NAME	CITY AND STATE OF DECEDENT RESIDENCE OR SITE OF DEATH
1. 11/23/2004	Death of male, 56 years old, source: 8/12/05 CPSC FOIA production	Walton, KY
2. 4/9/2005	Death of male, 60 years old, source: 8/12/05 CPSC FOIA production	San Juan Capistrano, CA
3. 7/2/2005	Alex Burleigh killed, 10 years old, source: 8/12/05 CPSC FOIA production	Rome Township, PA
4. 8/23/2005	Death of male, 52 years old, source: 8/12/05 CPSC FOIA production	Luverne, MI
5. 9/10/2005	Karen Harwood killed, 46 years old, source: 8/12/05 CPSC FOIA production	Carbonado, WA
6. 9/17/2005	Death of male, 41 years old, source: 8/12/05 CPSC FOIA production	Ashland, WV
7. 9/29/2005	Death of male, 21 years old, source: 8/12/05 CPSC FOIA production	Medford, NJ
8. 5/28/2006	Larry D. Bennett killed, male, 47 years old, source: 8/12/05 CPSC FOIA production	Pax, WV
9. 5/26/2006	Kristin Lake killed, 11 years old	Germfask Township, MI
10. 5/29/2006	Death of female, 11 years old, source: 9/28/07 CPSC FOIA production	Manishque, MI
11. 7/15/2006	Death of male, 33 years old, source: 8/12/05 CPSC FOIA production	Willow River, MN
12. 8/4/2006	Alyson Lea Proulx killed, age 16	Williams Lake, BC, Canada
13. 9/17/2006	McCoie Jones killed, mother of two, 34 years old, source: 8/12/05 CPSC FOIA production	Cedartown, GA

DATE OF RHINO ROLLOVER DEATH	DECEDENT NAME	CITY AND STATE OF DECEDENT RESIDENCE OR SITE OF DEATH
14. 11/22/2006	Sydney Anderson killed, 11 years old	Grand Rapids, MI
15. 11/22/2006	Death of female, 10 years old, source: 8/12/05 CPSC FOIA production	Hope Township, MI
16. 11/23/2006	Abbey West killed, 13 years old	Ocotillo Wells, CA
17. 11/26/2006	Dani Bernard killed, 18 years old	Ocotillo Wells, CA
18. 4/14/2007	Emily King killed, 21 years old	Imperial Sand Dunes, CA
19. 5/27/2007	Whitney Bland killed, 13 years old	Sabine Parish, LA
20. 6/22/2007	J.T. Crow killed, 9 years old	Winnsboro, TX
21. 7/28/2007	Wyatt Bauer killed, age 13	Rimbey, Canada
22. 8/7/2007	Dusty Lockaby killed, 14 years old	Winnemucca, NV
23. 9/13/2007	Death of Eddie Ray, 13 years old, source: 5/23/07 CPSC FOIA production	Orange, TX
24. 9/30/2007	Death of male, 19 years old, source: 5/23/07 CPSC FOIA production	Lacern Valley, CA
25. 10/25/2007	Mr. Woodall, 57 years old	Mesa, AZ
26. 10/28/2007	Ellie Sand killed, 10 years old	Cincinnati, OH
27. 11/29/2007	Ashlyn Vargas killed, 12 years old	Paso Robles, CA
28. 2/22/08	Lynn Carter killed, 57 years old	
29. 2/22/08	David Morgan killed, 21 years old	Las Vegas, Nevada
30. 2/23/2008	Stephanie Katin killed, 26 years old	Imperial Sand Dunes, CA
31. 2/23/2008	Richie Erl Masse killed, 14 years old	Imperial Sand Dunes, CA
32. 5/25/2008	Sara Colley killed, 12 years old	Virgie, KY
33. 8/17/2008	Lane McCloud killed, girl, 8 years old	Richardson, TX
34. 8/24/2008	Andrew M. Bahl killed, 3 years old	North Lancaster, WI
35. 10/4/2008	John Doe killed, 29-year-old male	Fairview, CA

DATE OF RHINO ROLLOVER DEATH	DECEDENT NAME	CITY AND STATE OF DECEDENT RESIDENCE OR SITE OF DEATH
36. 10/18/2008	Emily Bates killed, 11 years old	Lewisburg, TN
37. 10/18/2008	Lauren Dilworth killed, 11 years old	Lewisburg, TN
38. 10/27/2008	Mikhail Ayrapetyan killed, 56 years old	Adelanto, CA

Some of the many Rhino rollover deaths and/or major injuries reported to CPSC and/or to Yamaha

- J.H. Adult male. Crushed ankle; required multiple screws.	- M.D. Adult male. Maimed hand.
ALASKA	- M.E. Adult male. Leg crushed and developed pulmonary embolism.
- D.H. Minor male. Dislocated elbow and wrist, and several broken bones in his left arm.	- M.W. Adult male. Crushed hand; amputation of three of his fingers and the partial amputation of palm.
ARIZONA	- S.S. Adult male. Catastrophically injured; crushed lower right leg; fibula pulverized.
- A.D. Minor female, belted passenger. Crushed leg.	- T.B. Adult male. Leg injured.
- C.E. Adult male passenger. Maimed lower right leg; belted.	- W.B. Adult male. Leg crushed.
- C.D. Minor passenger. Female, 16 yrs old; belted. Smashed left arm/injured ankle.	- D.B. Minor female. Died of head trauma.
- H.B. Adult female. Maimed hand; amputation of pinky and ring fingers.	- A.W. Minor female. Died in turnover.
- J.S. Adult male. Crushed his right foot.	- A.V. Minor female. Died in turnover.
- M.P. Adult male passenger. Lost index finger of dominant hand; belted.	- R.R. Adult male. Injuries to his right hip, hand, foot, and knee
- R.V. Adult male. Left leg and ribs broken.	- R.M.. Adult male. Disabling injuries to his neck, shoulders, and right leg.
- S.S. Minor female. Both feet crushed.	- C.R. Adult male. Severe double compound fracture of his right tibia and fibula.
- J.W. Adult male. Gaping wound that split open the skin and muscle of his right leg.	- J.C. Adult male. Crushed right foot.
CALIFORNIA	- J.B. Adult male. Double compound fracture of his tibia and fibula.
- R.P. Crushed left leg; belted & helmeted.	- J.R. Adult male. Crushed right leg.
- M.W. 3 fingers on left hand amputated; belted.	- A.V. Female minor. Killed in tipover.
- Adult male driver. Killed in Orange County on April 4, 2004 (from CPSC report).	- S.K. Adult female. Killed in tipover.
- A.B. Minor male. Crushed arm.	- E.S. Adult male. Crushed left fibula.
- A.R. Adult male. Crushed left hand; compound fracture of index finger and severed thumb.	- E.M. Adult male. Crushed left leg.
- A.S. Adult male. Catastrophically injured; leg crushed.	- D.K. Adult male. Loss of three fingers.
- D.B. Adult male. Arm and foot severely injured.	COLORADO
- D.J. Adult female. Sustained concussion, fourteen stitches in her head, broken finger and injured her knee.	- J.M. Adult male passenger. Maimed right foot; belted.
- E.C. Adult male. Leg crushed; bruised spleen.	- C.S. Adult female. Crushed foot.
- G.A. Adult male. Catastrophically injured; crushed right foot.	- J.M. Adult mail passenger. Crushed his dominant foot.
- J.C. Minor female. Feet crushed.	FLORIDA
- J.L. Minor male. Smashed leg.	- B.G. Adult male. Crushed ankle; lost four inches of bone in leg.
- J.R. Adult male. Crushed foot.	- T.C. Adult female. Catastrophically injured; both legs were crushed resulting in amputation of right leg three inches below the knee.
- M.C. Adult female. Crush fractures to first, second and third metatarsals.	- J.H. Adult male. Crushed both feet.
	- J.P. Adult male. Right tibia was broken.
GEORGIA	NEW JERSEY
- J.L. Adult male driver. Partial amputation of foot; belted.	- Adult male passenger. Killed in Medford on September 29, 2005 (from CPSC report).
- S.L.K. Minor passenger. 14 yr old female. Mid-foot amputation; belted.	NEW MEXICO
- Adult female driver. Killed in Cedartown on September 17, 2006 (from CPSC report).	- P.M. Adult female. Crushed leg.
- D.B. Adult male. Leg crushed.	NEW YORK
ILLINOIS	- K.T. Adult male driver. Maimed left leg.
- L.H. Adult male. Leg severely crushed.	- M.H. Minor driver. 17 yr old male. Shattered left arm. Belted.
INDIANA	- G.T. Adult male driver. Injured left shoulder, hip and foot.
- T.M. Adult male driver. Crushed foot; belted.	- C.K. Minor passenger. Male, 16 yrs old. Dominant hand crushed and degloved. Belted.
- N.G. Adult male. Crushed leg.	- V.C. Adult female. Crushed hand.
- M.M. Adult male. Crushed left foot.	- M.B. Minor female. Crushed leg.
KENTUCKY	NORTH CAROLINA
- M.S. Adult male passenger. Maimed right ankle; belted.	- A.C.P. Adult male. Devastating injuries to left hand and arm.
- Adult male driver. Killed in Walton on November 23, 2004 (from CPSC report).	- I.T. Adult female. Crushed foot.
- F.C. Adult male. Traumatic below-knee amputation of right leg.	OHIO
- S.C. Minor female. Killed in rollover.	- S.B. Adult male passenger. Right foot severely maimed. Belted.
- Adult male. Killed. October 25, 2007.	- E.K. Adult female driver. Left arm and left foot crushed; belted.
LOUISIANA	- E.S. Minor passenger. Female, 10 yrs old. Killed in rollover in Lebanon, OH. Belted.
- R.C. Adult male. Sustained broken bones and permanent injuries in his thigh and foot.	OKLAHOMA
MAINE	- L.A. Adult male. Broken right fibula and tibia.
- B.L. Adult male driver. Left foot crushed; belted.	- M.M. Minor male. Killed in rollover in McClain County.
MICHIGAN	OREGON
- Minor female passenger. 10 yrs old. Killed in Hope Township on November 22, 2006 (from CPSC report).	- J.W. Adult male. Right ankle crushed.
- Minor female passenger. 11 yrs old. Killed in Manistique on May 26, 2006.	- S.R. Adult male. Left arm and left leg crushed.
- J.B. Adult male driver. Maimed left foot. Belted & wearing helmet.	PENNSYLVANIA
- A.H. Minor female. Maimed hand; traumatic amputation of ring and pinky finger.	- Minor. Male, 10 yrs old. Killed in Rome Township on July 2, 2005 (from CPSC report).
MISSISSIPPI	- C.B. Adult male. Crushed ankle; required plate and several screws.
- B.J. Adult male driver. Left leg maimed; belted.	- J.G. Adult male. Double compound fracture of his tibia and fibula.
MISSOURI	SOUTH DAKOTA
- L.L. Adult female. Crushed right wrist.	- R.L. Minor passenger. Male, 6 yrs old; belted. Right arm crushed
NEVADA	TENNESSEE
- D.D. Adult male passenger. Severe foot injury; belted.	- B.M. Minor female. Crushed right foot, injuries to her right ankle, knee, and arm.
- C.R. Adult male. Fractured right tibia, as well as crushing injuries and puncture wounds to left foot.	
- D.L. Minor male. Killed in tipover.	

TEXAS

- Beloved J.T. Crow. Minor passenger. Male, 10 yrs old. Killed in rollover in east Texas. Belted.
- S.K.C. Minor. Female, 13 yrs old. Left arm amputation; belted.
- B.A. Minor. Male, 12 yrs old. Crushed left leg; belted.
- T.A. Minor passenger. Female, 16 yrs old. Crushed right leg.
- J.B.H. Adult male. Crushed hand.
- L.W. Minor male. Right leg crushed.
- H.C. Minor female. Crushed leg.

UTAH

- K.R. Minor passenger. Female, 15 yrs old. Crushed hand/injured leg; belted.
- B.W. Adult female. Crushed leg.

VIRGINIA

- J.B. Adult male. Left leg injured; extensive tissue damage and a compound fracture of tibia and fibula.
- J.W. Adult female. Crushed right foot.

WASHINGTON

- J.P. Adult male driver. Right leg crushed. Belted.
- Adult female passenger. Killed in Carbonado on September 10, 2005. (from CPSC report).
- S.B. Adult male. Crushed left tibia.

WEST VIRGINIA

- Adult male driver. Killed in Page on May 28, 2006 (from CDSC report).
- Adult male driver & adult female passenger. Killed in Ashland on September 17, 2005. Wearing seatbelts and helmets (from CPSC reports).

CANADA

- ALBERTA S.P. Adult male. Crushed foot.
- NEW BRUNSWICK S.R. Minor male. Full amputation of middle finger, partial amputation of index finger, and twenty-one bone breaks in ring finger.
- ONTARIO C.S. Adult female. Jaw, skull, and neck fractured.

MEXICO

- M.S. Adult male. Compound fracture of tibia and fibula.

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