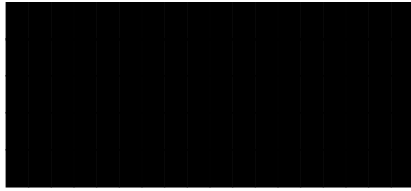


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Heidi Crow's August 2008 Submission to United States
Consumer Protection Safety Commission Regarding
Proposed Safety Improvements to the Yamaha Rhino

**Safety Changes Are Urgently Needed
For The Yamaha Rhino.**

**Safety Changes Are Necessary To
Avoid Needless New Rhino Tipovers,
Deaths, Amputations, Crushes,
Fractures, Surgeries, and Other
Disabling and Permanent or Fatal
Injuries**

Submission Date: August 21, 2008

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I. INTRODUCTION

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 tipover. On June 22, 2007, J.T. and his older sister Madison went for a ride in the family's recently purchased, new 2007 model year Yamaha Rhino, model 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 ¼ roll or tipover at very slow speed, and still J.T. was ejected 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 and are working to prevent repeat fatalities and accidents. Heidi Crow and her family led an ATV Awareness Day in Winnsboro, Texas last year where dozens of citizens marched for ATV safety in honor of J.T.

On August 29, 2007, nine weeks too late to save J.T., Yamaha Motors issued new safety warnings and agreed to retrofit all Rhinos ever sold with safety half-doors and safety handholds in the passenger seat position. More must still urgently be done to improve Rhino safety and stability.

II. HOW DID THIS FATAL TRAGEDY HAPPEN TO J.T.?

The Crows have looked back and worked to understand how this tragedy happened. *Rhino drivers and riders all over the country have suffered serious injuries and death, when their unstable Yamaha Rhinos tipped or rolled over.*

The Rhino is top-heavy, with too narrow a track width, no rear differential, too high a center of gravity, wheels too small to maintain stability, steering geometry that facilitates

rollovers and tipovers even at low speeds in flat terrain, and a heavy rigid steel roll cage that has no safety padding.

J.T. was not the first to die in a Yamaha Rhino. At least 20 other consumers have been killed and many others maimed or injured by Rhino rollovers prior to and after J.T.'s death.

Innocent buyers and passengers and families have been misled by the guise of safety created by Rhino roll cages, seat belts, and by Yamaha's aggressive Rhino marketing. Safety half-doors, additional passenger handholds and heightened new tipover warnings that should have been present from the beginning were only recalled/retrofitted on and after August 29, 2007, nine weeks too late for J.T. More must still be done to protect consumers.

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

The fatal consequences of vehicle rollovers have been prominent since 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 top heavy utility vehicles were rolling over at five times the rate of passenger cars. Accident data from the National Highway Traffic Safety Administration (NHTSA) shows that death and disabling injuries were twice as high in top heavy utility vehicles compared to passenger cars. In 2003, of the 281,000 vehicles rollovers, well over 10,000 resulted in fatalities and approximately 170,000 resulted in serious injuries.

Resistance to rollover is easy to achieve with appropriate design and testing. Improving vehicle stability profoundly reduces morbidity and mortality. (*See, e.g., Extraordinary Safety Benefits of Electronic Stability Control.*)

B. The Rhino's .88 Static Stability Factor is Shockingly Low

Despite Yamaha's advertisements encouraging Rhino use in rugged terrain, the Rhino was never designed to travel safely off road. The Rhino is the most top-heavy vehicle ever

measured at the Engineering Institute. Reconstruction by Scientific Analysis, Inc. and Andrew Irwin of J.T. Crow's accident and death confirms a slow speed, 14 to 19 mph rollover of an unstable, top-heavy, doorless, pre-recall and pre-retrofit Rhino 450.

The dangerously low 0.88 Static Stability Factor of the Rhino makes it tippier than any automobile or truck. But unlike trucks that travel mostly on smooth roads designed for safety, the Rhinos are advertised for use on uneven ground, where they are at highest risk of tip-over.

Static Stability Factor values are such reliable predictors of rollover propensity that they form the basis for NHTSA's star rollover rating system. A static stability factor of 1.04 or less corresponds to a one star rating and a rollover risk of 40% or greater. A static stability of .88, applicable to the Rhino, would equate to zero stars and virtually guarantees rollover.

Dynamic testing reveals the standard configuration of the Rhino to be directionally unstable, characterized by a transition to severe oversteer at lateral accelerations as low as 0.25 to 0.3 g's. Testing of easily available alternative Rhino designs reveal that simple design changes can easily eliminate its directional instability. An alternative design can create drastic improvement in the rollover threshold of this vehicle as well with lateral accelerations as high as 0.87 g's on concrete not resulting in rollover.

C. **Doors And New Passenger Handholds Were Added And Warnings Issued Too Late To Save J.T. Crow**

Yamaha markets and sells new Rhinos differently now than it did prior to August 2007, when it issued warning recalls and replacements. Rhino models now offer tipover warnings and new hardware in the form of new passenger handholds and "Tough, roto-molded doors to keep mud, water and dirt on the trail where they belong; and comfortable new passenger grab handles," added safety features which did not exist in prior models and which Yamaha has offered to add to all models for free. (See Exhibit 6, 2007 Yamaha Technical Bulletin and

August 27, 2007 Owner letter.) None of these changes, however, impacted the stability of the vehicle and its propensity to tip over.

Rhinos have been sold for years without an enclosed passenger compartment and the vehicle appearance gives consumers a false guise of safety in the form of the vehicle's full roll cage. During the many foreseeable rollovers, partial or total ejection of the occupants is inevitable as is the unpadded roll cage's tendency to cause catastrophic ensuing crushing injuries, fractures, traumatic amputations, head injuries and, in the case of J.T. Crow and several like him, death.

Yamaha continues to aggressively advertise and promote Rhinos yet now it warns that "While the Rhino has been a reliable and versatile vehicle, some operators have engaged in aggressive driving (such as sliding, skidding, fishtailing, or doing donuts) or made abrupt maneuvers (such as turning the steering wheel too far or too fast) that have resulted in side rollovers – even on flat, open areas. Unfortunately, some occupants have been seriously injured during such rollovers when they put their arms or legs outside the vehicle, resulting in crushing or other injuries."

Yamaha belatedly now provides free doors to all Rhino owners through its Special Offers. This modification came nine weeks too late to save J.T. Crow.

D. Half Doors Are Insufficient Because They Fail to Protect Driver Hands and Arms and Fail to Protect Heads of Drivers and Passengers

Rhino recalls added half doors to vehicles starting in August 2007. Post retrofit accidents and injury patterns now primarily involve: head injuries and/or deaths and/or hand/arm injuries and/or amputations. These too are needless injuries and losses, easily avoidable with stability improvements and/or with full doors on the Rhino such as those used by Baja UTV on its Rhinos as depicted and explained in Exhibit 11.

E. Far Too Many Rhino-Caused Avoidable Catastrophic Accidents Have Occurred Nationwide

The Yamaha Rhino is excessively prone to rollover during turns even at low speeds because of inherent flaws in its design and manufacturing, including a much too narrow a track width, too high a platform, and too top-heavy a design. Misdesign allows the Rhino to roll easily even at low speeds and while conducting normal turns. Yamaha has undoubtedly had the knowledge and been aware for years of the propensity of the Rhino to rollover, and of the serious injuries and deaths it could and has caused drivers and passengers in tipover accidents.

Rhino tipovers and injuries have often involved Yamaha Motor test drivers and employees, including tipover and/or tipover injuries to Yamaha France employee Jean Claude Olivier, Engineering Vice President Mr. Ike Miyachi, President Casey Yoshida, test engineer Caleb Chesser, product tester Phillip McRae, and test rider Patrick Biolsi. Despite such knowledge, Yamaha has yet to modify the Rhino's design to correct its stability problems.

I believe Yamaha has misled the government, public and consumers about the safety of the Rhino vehicles and also, by historically failing to promptly report all known Rhino tipovers, injuries, amputations and deaths to the United States Consumer Products Safety Commission.

An earlier retrofit, a full door, a better, more stable initial design, and/or roll cage padding would all have easily prevented the death of beloved Jeremy Todd Crow and saved countless others from terrible injuries, suffering, damages and losses.

Yamaha ignored for years Rhino door defect concerns that were or should have been obvious from the outset. *See, e.g.*, December 2005 Sand Addiction Magazine article on Yamaha Rhino, p. 9 of 11, "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. A door, net or additional bar is necessary to keep your feet in the more protected cab."

The need for additional Rhino safety measures is similarly compelling and should include rollbar padding, full doors, wider track and/or rear differential.

F. Roll Bar Padding Is Desperately Needed

The Rhino's roll cage is heavy, rigid and unpadded, It is defective and deadly to unsuspecting consumers. The heavy unpadded roll cage causes catastrophic crushing injuries, head injures and deaths that would not occur with basic safety padding urgently needed. Roll bar padding has been available for decades and would dramatically reduce the risk of leg and head injuries in Rhino rollovers. Yamaha should recall the Rhino to include roll bar padding. The Rhino's lower roll bar crushes legs and the higher Rhino roll bars cause major arm and often fatal head injuries. We believe J.T. died from a blow to the head from the roll cage.

Effective roll cage safety padding is available retail for approximately \$1 per foot. The cost to Yamaha for this material purchased in high volumes would likely be pennies per foot and it is likely the entire roll cage could have been properly padded for well under \$5. Such padding would have saved JT Crow's life and reduced his injury levels to well below permanent debilitating levels.

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

The unpadded Rhino roll cage is a dramatic threat to life and safety in a wide variety of clearly foreseeable tipover 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.

The benefits of padding interior surfaces have been well recognized by not only the federal government but all major automobile manufacturers from as far back as the mid-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).

Contact with the roll cage elements is highly foreseeable and a reasonable manufacturer was obliged to adequately design and pad these surfaces to provide adequate occupant protection. Yamaha never effectively tested the Rhino roll cage’s tendencies to injure, maim and kill vehicle occupants since any effective testing would have revealed the need for safety padding.

Indeed, a prophetic 1994 presentation by engineers at Failure Analysis Associates, Inc. predicted that rollover protection roll cages on ATVs would result in reduced driver control (for reduction of ability to actively steer) and would “mousetrap” and/or “Flyswatter” occupants in a tipover. (Exh. 11, 1994 article by R.L. Piziali, *et al.*, see figure 7).

Jeep Wrangler roll bars have been padded since 1995 because of a rash of major leg and head injuries and deaths in Jeep rollovers. Yamaha negligently failed to install pads on the Rhino roll cages, dangerously mounted on a tip over prone vehicle next to vulnerable passenger legs, heads and arms. The failure of the occupant protection system and the lack of appropriate

padding rendered the vehicle defective and unreasonably dangerous beyond the contemplation of the average consumer.

G. There Is Still Time For Yamaha To Avoid Needless New Injuries And Deaths

“He who saves one life, saves the entire world,” I believe. I hope lessons are learned from J.T.’s death and further steps are taken to avoid needless new rollovers, injuries, amputations and deaths. Widening the Rhino, lowering its center of gravity, adding rear differential, using full doors, and/or adding roll cage padding now would do much to avoid needless new injuries and deaths.

J.T. Crow was a straight A student at elementary school in Winnsboro, Texas. He was a U.S. Presidential Scholar. He loved science and learning about animals, especially butterflies and birds. J.T. also loved playing soccer and football. One day, he was going to play football for the Texas Longhorns, he promised.

Children are irreplaceable. Consumers deserve much more protection from the Rhino.

H. Dynamic Testing Reveals Extraordinary Problems With The Rhino, Require Urgent Redesign

What follows is a summary of dynamic Rhino testing revealing extraordinary directional instability and extraordinary propensity to rollover. Also included is a proposed alternative design which testing reveals would easily correct and fix the Rhino’s directional stability and add considerable resistance to rollover.

1. Dynamic Testing Conclusions

- Dynamic testing reveals the standard configuration of the Rhino to be directionally unstable, characterized by a transition to severe oversteer at lateral accelerations as low as 0.25 to 0.3 g’s.
- A variety of test maneuvers on concrete and on grass demonstrate that

the Rhino will roll over from driver steering inputs at low lateral acceleration levels.

- Testing demonstrates Rhino rollovers at lateral accelerations as low as 0.56 g's.
- The Rhino's rollover threshold is shockingly and unacceptably low and can easily be exceeded even during proper use of the Rhino.
- The directional instability of the Rhino combined with its rollover propensity make it unusually dangerous and unpredictable.
- Easily available alternative Rhino designs consist of simple design changes that easily eliminate Rhinos' directional instability.
- An alternative design – wider track width and rear differential -- create substantial improvements in the rollover threshold of this vehicle as well with lateral accelerations as high as 0.87 g's on concrete not resulting in rollover.

I. Alternative Design

When two modifications – widening the track and adding a rear differential -- were made, the vehicle's resistance to rollover and directional stability both improved tremendously. A differential was added which makes the rear anti-sway bar unnecessary. A differential allows the inside and outside tires to turn at different speeds. The differential mounted was a front differential off a Rhino 700. Widening of the track-width was accomplished by adding 4 inch aluminum spacers at each wheel. This resulted in an 8 inch track width increase at the front and rear of the vehicle. When tested, the alternative design resulted in substantial improvement in directional stability and resistance to rollover.

III. THE RHINO TIPOVER AND DEATH OF J.T. CROW

The Rhino tipover that killed J.T. Crow occurred in late afternoon while the family was working to clear trees on the family farm in South Texas. The 12 year old driver, Madison had been driving motorcycles, dirt bikes, ATV's, quads and tractors since age 6, all without incident, without accident and without injury. She was an extremely responsible and experienced vehicle operator. She could easily reach all the Rhino pedals when seated properly with her back on the seat and she had the maturity, strength and good judgment necessary to safely operate the Rhino and other vehicles.

Prior to first riding the Rhino, Madison and her grandfather Canter Mattox carefully reviewed every page of the operators' manual and watched the Yamaha Rhino DVD's. Madison was lawfully and properly operating the Rhino on private property when the tipover occurred at slow speed, estimated by accident reconstructionist Andrew Irwin at 13 mph–19 mph. Madison and J.T. were both belted and were supervised by their grandfather at all times. Mr. Maddox was riding several feet behind the Rhino on a motorcycle. Neither Madison nor J.T. wore helmets in light of the vehicle's full roll cage. Seat belts seemed adequate and should have been ample to protect them as they drove on flat, well established trails and Texas law did not require helmets. Madison was driving prudently and carefully when the slow speed tipover occurred without warning.

Canter Mattox watched the Rhino tipover and immediately ran over to aid J.T., who was still entangled in his seat belt. Canter had to first unbuckle J.T.'s seat belt in order to untangle him from the belt and lift the Rhino off of him. Canter and Madison then drove J.T. to the farmhouse and then to a gas station where they met up with a nurse and Game Warden Ellis Powell. They were met by an ambulance shortly thereafter. Canter performed CPR upon J.T.

until the nurse and paramedics took over. J.T. was pronounced dead at 9:25 p.m. that evening at the hospital.

JT died from head injuries and a suspected broken neck according to the death certificate and medical records from Jasper Memorial Hospital. (Exh. 12). I believe these injuries were caused by the unpadded roll bar and the general instability of this vehicle. The unpadded Rhino roll cage would likely have broken JT's neck and killed him anyway even if he had been helmeted.

Had the Rhino been properly designed to be more stable, the Rhino would never have tipped over and killed JT. Similarly, had the Rhino been built without any roll cage it would have been less top heavy and not tipped; and even if it had tipped, JT would never have been mousetrapped and killed by the roll cage. (Exh. 11, Figure 7). Had the Rhino roll cage been padded, JT's neck and head would both have been protected and he would not have been killed.

Ford Motor Company's Explorer SUV was wildly popular with consumers – like the Yamaha Rhino – despite its own propensity to roll over. Ford's 2002 model year re-design, with wider track width, vastly improved the vehicle's rollover resistance. The re-design also allowed Ford to avoid countless new Explorer rollover injuries and deaths.

IV. CONCLUSION

I appreciate the opportunity to meet with CPSC to discuss Rhino casualties and the readily available, simple safety modifications necessary to prevent needless new tipovers, deaths, amputations, permanent injuries, crushes and fractures.

Heidi Crow