All-Terrain Vehicles (ATVs)

Project Status Report

February 2008

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Executive Summary

In August 2006, the U. S. Consumer Product Safety Commission (CPSC) issued a Notice of Proposed Rulemaking (NPR) proposing to ban three-wheeled all-terrain vehicles (ATVs) and mandate performance, informational, and offer-of-training requirements for youth and adult ATVs.[1] The NPR included instruction to the CPSC staff to take several specific actions regarding ATVs.[2]

This report describes the progress the staff has made on carrying out the actions directed by the Commission. The staff:

- completed a pilot study of youth in-depth investigation (IDI) fatality reports;
- visited three ATV manufacturing plants to learn about design and test criteria;
- visited the National Highway Traffic Safety Administration's Vehicle Research and Test Center to discuss dynamic vehicle testing;
- considered the appropriateness of tandem youth ATVs;
- considered the feasibility of requiring pre-purchase training for first-time ATV purchasers;
- released two Requests for Information (RFIs) related to the Commission's directions about determining an appropriate weight of rider / weight of ATV ratio and maximum speed of youth model ATVs;
- developed a tab for the www.atvsafety.gov Web site that provides key injury and death statistics; and
- has been testing and evaluating nine youth model ATVs at the U.S. Department of the Army's Aberdeen Test Center in Aberdeen, Maryland (Aberdeen).

As directed by the Commission, the staff intends to:

- explore the appropriateness of designing different training programs for various age groups of children;
- examine the issue of illumination on youth ATVs;
- explore the need and usefulness of revising the incident injury form on the www.atvsafety.gov Web site to solicit as much information about ATV incidents as possible; and
- explore the need for separate information and education programs for parents and children.

The staff plans to continue its work on these activities with a target completion date of June 30, 2008, for responding to the Commission-directed actions. At that time, the staff will send a second status report to the Commissioners that will assess and evaluate the information gathered from carrying out the Commission-directed actions.

This status report also provides information on the work the CPSC staff is doing or planning to do on other ATV project activities. These activities include:

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[1] Consumer Product Safety Commission, "Standard for All Terrain Vehicles and Ban of Three-Wheeled All Terrain Vehicles: Notice of Proposed Rulemaking", 71FR 45904 (August 10, 2006).
[2] Consumer Product Safety Commission, Id. at 45929.

- preparation of the annual report of ATV-related deaths and injuries;
- compliance activities;
- information and education activities;
- keeping track of developments in the market for ATVs;
- monitoring the activities of the voluntary standards group;
- responding to the comments submitted to the Commission in response to the NPR;
- additional testing at Aberdeen and research and development work at the CPSC Laboratory related to that testing;
- planning for holding focus groups and one-on-one interviews dealing with maximum speed of youth ATVs; and
- ATV incident reconstruction work.

This report describes these activities and provides timeframes for their completion or implementation.

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UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
WASHINGTON, DC 20207

Memorandum

February 13, 2008

TO : The Commissioners
Todd A. Stevenson, Secretary

THROUGH: Lowell Martin, Acting General Counsel
Patricia Semple, Executive Director

FROM : Robert J. Howell, Acting Assistant Executive Director for Hazard Identification and Reduction
Elizabeth W. Leland, Economic Analysis, ATV Project Manager

SUBJECT : All-Terrain Vehicle (ATV) Project: Status Report

A. Introduction

In August 2006, the U. S. Consumer Product Safety Commission (CPSC) issued a Notice of Proposed Rulemaking (NPR) that proposed to ban three-wheeled all-terrain vehicles (ATVs) and mandate performance, informational, and offer-of-training requirements for youth and adult ATVs.[1] The NPR included Commission instruction to the CPSC staff to take several specific actions regarding ATVs.[2] This report describes the staff's progress on those actions.

In addition to working on the rulemaking-related actions directed by the Commission, the staff is carrying out other ATV-related activities as a part of the ATV project. This report describes the status of those activities.

The staff plans to continue its work on these activities with a target completion date of June 30, 2008, for responding to all Commission-directed actions. At that time, the staff will send a second status report to the Commissioners that will include an assessment and evaluation of the information gathered from its activities.

B. Commission Instruction to the CPSC Staff

The Commission's direction to the staff included eight actions that focus on youth ATVs and five that focus on ATVs in general. The staff has completed work on many of these actions, and will continue or initiate work on the remaining actions. The Commission-directed actions are listed below in italics, followed by a description of the staff's progress.

Youth ATVs

1. Analyze all in-depth investigation reports and any other detailed reports of injuries we may have to children on ATVs to determine what factors contributed to the incidents and to determine

[1] Consumer Product Safety Commission, "Standard for All Terrain Vehicles and Ban of Three-Wheeled All Terrain Vehicles: Notice of Proposed Rulemaking," 71 FR 45904 (August 10, 2006).
[2] Consumer Product Safety Commission, Id. at 45929.

whether additional changes could be made to the operational / handling characteristics of youth ATVs that would reduce or eliminate injuries and deaths due to those factors.

Based on the limitations of available injury data,[3] staff decided to conduct a pilot study consisting of a review of approximately 100 youth *fatality* in depth investigations (IDIs) involving either adult or youth model ATVs. The staff has completed the pilot study, and a report from the Directorate for Epidemiology describing the study's methodology and results is located at Tab A.

2. Test current youth models against one another to determine if there are characteristics of some models that make them more stable or otherwise less incident prone than other models.
and
3. Determine whether making the junior and /or pre-teen youth models less rider interactive (lateral stability, braking systems, etc.) could reduce or eliminate deaths or injuries on youth models.

The staff's work on these two actions has been based on a) test and evaluation of youth ATVs and b) visits to ATV companies and the National Highway Traffic Safety Administration's (NHTSA's) Vehicle Research and Test Center to discuss its experience with testing related to automotive stability.

Vehicle Testing

CPSC staff signed a Memorandum of Understanding (MOU) with the U. S. Army Automotive Test Center in Aberdeen, Maryland (Aberdeen), to perform an initial test and evaluation program for nine different youth ATVs. The objective of the tests is to evaluate the static and dynamic performance of several youth model ATVs against each other and against the performance requirements of the voluntary standard, *American National Standard for Four Wheel All-Terrain Vehicles – Equipment, Configuration, and Performance Requirements, ANSI / SVIA 1-2001.* Testing at Aberdeen began in October 2007 and will continue through March 2008. Under the conditions of the MOU, Aberdeen, at the conclusion of the testing, will prepare and submit to CPSC staff a preliminary report that compiles the test result data. Following CPSC staff review, Aberdeen will have additional time to submit a final report to CPSC staff.

After receiving the final Aberdeen test results report, the CPSC Engineering Sciences (ES) staff will analyze the test results and prepare a final report that addresses the Commission-directed actions 2 and 3. As CPSC staff has noted previously, the exploration of lateral stability and rider interactivity issues is exceedingly complex and would require extensive test and evaluation with cooperation among CPSC, industry, and other private-sector entities.[4] CPSC

[3] These limitations are as follows: 1) injury records received through the National Electronic Injury Surveillance System (NEISS) generally do not contain information that would enable determination of either the hazard pattern or the type of ATV (youth or adult) involved in the incident, 2) injury information received in Injury and Potential Injury Incident (IPII) records generally does not contain details about the subject incidents, 3) the number of injury In Depth Investigations (IDIs) in the CPSC database is very small, and 4) the 2001 ATV Injury and Exposure Studies may not fully reflect current injury factors.

[4] "CPSC Staff Response Regarding Follow-Up Questions from Commissioner Nancy Nord after the June 15, 2006 ATV Safety Review Briefing," Memorandum from Jacqueline Elder and Elizabeth W. Leland, June 30, 2006, p. 3 and "CPSC Staff Response Regarding Follow-Up Questions from Commissioner Moore after the June, 15, 2006, ATV Safety Review Briefing," Memorandum from Jacqueline Elder and Elizabeth W. Leland, July 11, 2006, pp. 9, 11.

staff considers the current testing at Aberdeen to be an *initial step only* in exploring rider interactivity and its role in reducing injuries and deaths associated with ATVs. The ES report will provide the results of these tests, with an evaluation of their implications, if any, for any future work that might be done to assess the role of rider interactivity in the deaths and injuries associated with ATVs.

Visits: National Highway Traffic Safety Administration (NHTSA) and Several ATV Companies

The CPSC ES staff visited the NHTSA Vehicle Research and Test Center in Ohio to:

- discuss whether any aspects of NHTSA's experience with dynamic vehicle testing of on-road vehicles might be applicable to ATVs,
- view and discuss the instrumentation/measurement hardware used for rollover testing,
- discuss whether the Vehicle Research and Test Center's test and evaluation methods can be applied to ATVs,
- discuss advances in automotive technology to address vehicle stability and handling,
- discuss NHTSA's experience in computer modeling dynamic responses of vehicles, and
- discuss testing in off-road vs. on-road environments.

Tab B from the Directorate for Engineering Sciences provides detailed information about the testing at Aberdeen and the visit to NHTSA. Additional information from the staff's visit to NHTSA is located at Tab C.

CPSC ES staff also visited the plants of three ATV companies to learn about each company's design and test criteria. In particular, staff wanted to learn about the test methods used to determine compliance with the current voluntary standard as well as the test methods that are used to evaluate vehicle stability and performance. A CPSC ES memorandum summarizing the visits to the manufacturing plants as well as the individual trip reports contains proprietary information and will be provided separately.

4. Explore the feasibility of providing guidance to purchasers on the appropriate weight of the youth model ATV in relation to the weight of the rider and of providing guidance to manufacturers on an upper limit on the weight of the junior and pre-teen ATVs.
and
5. Do research to determine if the top speed of thirty miles per hour for the teen youth model[5] is excessive and whether reducing the speed would reduce or eliminate deaths and injuries on those vehicles.

The CPSC Human Factors (ESHF) staff prepared two Requests for Information (RFIs) for release to the public in order to ascertain the extent of current knowledge and the existence of research capabilities for determining the appropriate ATV weight and appropriate maximum speed for youth model ATVs.[6] The two RFIs were released through Federal Business

[5] A maximum speed of 30 miles per hour for the teen youth model was proposed by CPSC in the August 10, 2006, NPR.

[6] Staff has previously indicated that exploring the feasibility of providing guidance to purchasers will require that the staff first determine (or know if it is possible to determine) an appropriate weight of rider in relation to weight of the ATV. The difficulties in arriving at an exact specification for weight of rider in relation to weight of ATV or to determine an acceptable weight range for child drivers in particular age categories have been previously described in staff memoranda to the Commission. (See "CPSC Staff Response regarding Follow-Up Questions from

Opportunities (FEDBIZOPPS), the federal government's single point-of-entry for federal government procurement opportunities over $25,000. The first RFI, "Mechanical Modeling of ATVs and Biomechanical Modeling of ATV Drivers under the Age of 16," received three responses, and the second, "Research Options to Study Drivers under the Age of 16," received two responses. The RFIs can be found at Tab D. A summary of the responses, with considerations for further action, contains proprietary information and will be provided separately.

The issue of an appropriate maximum speed also has arisen in comments to the NPR and with respect to the recently-revised industry voluntary standard. The staff is planning additional work on this issue in FY 2008. See Section D.1 below.

6. Determine how ATV training for children in the three age groups should be structured to maximize their ability to learn the safety information and riding skills (for example, should we require that a separate ATV training course for children be developed?).

ATV training programs for children already exist within the private, not-for-profit, and state and local government sectors. Before determining how to structure ATV training for children, staff plans to contact these organizations to discuss with them the structure and content of their training programs, especially as the programs pertain to various age groups of children.

7. Determine whether the NPR as issued for public comment would ban the future manufacture of tandem youth ATVs.

The text of the NPR as issued prohibits youth ATVs designed for use by more than one rider.

8. Analyze CPSC data to determine the desirability of illumination on youth ATVs (in both daytime and nighttime situations) to reduce deaths and injuries to riders.

As a part of the pilot study that was undertaken to address Action 1 above, the staff included in its review of youth fatality IDIs a search for information regarding illumination. That study did not yield any information to assist in answering the above question. (See Tab A, pages 16 and 18.)

In addition, a question concerning illumination was included in the RFI "Research Options to Study Drivers under the Age of 16" (Tab D), but none of the information submitted in response to the RFI provided any specific indication that research related to illumination has been done.

Staff is continuing to consider this question and will provide a response to this action, including a discussion of the feasibility and resources needed for further work, in the second status report to be completed by June 30, 2008.

ATVs in General

1. As part of the on-going information and education campaign, Human Factors and other staff shall work with the Office of Information and Public Affairs to ensure that the core message that

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Commissioner Nancy Nord after the June 15, 2006 ATV Safety Review Briefing," Memorandum from Jacqueline Elder and Elizabeth W. Leland, June 30, 2006, pp. 3 – 5). Staff agreed that before undertaking research about an appropriate maximum speed for the teen youth model ATV, it was first important to determine if any research has been conducted or if any capabilities for such research currently exist.

is developed with regard to children under 16 driving ATVs is as effective as possible. Explore whether two campaigns should be developed: one directed to children and one directed to the parents/adult drivers.

Staff plans to complete this action and provide a response in the June 2008 status report.

2. Explore the practical feasibility of requiring pre-purchase training for first-time ATV drivers.

Staff has addressed the non-legal issues related to requiring training for first-time ATV *purchasers.* See Tab E from the Directorate for Economic Analysis.

3. Review and revise, where necessary, the incident reporting form on the ATV Web site to solicit as much information about ATV incidents as possible to assist staff in current and future ATV incident evaluations.

The CPSC staff will be reviewing the results of the pilot study (Commission-directed Action 1, page 2 above) as well as the content of the current ATV IDI form before reviewing and revising the incident reporting form on the CPSC ATV Web site. Staff expects to complete the review and any proposed revision of the incident reporting form in June 2008.

4. Create a new tab on the ATV Web site that would contain everything parents ought to know about ATV safety for their children.

The CPSC staff developed a tab on the Web site, titled "What to Know Before You Go," which provides succinct key information related to ATV safety, including death and injury data. The tab can be found at http://www.atvsafety.gov/beforego.html.

5. Detail the plan for enforcement and monitoring of the ATV age guidelines under the new proposal and explain how it would differ from current practice and what additional enforcement tools it would provide the Commission.

The Office of Compliance provided information about age guidelines monitoring under the proposed rule in a restricted memorandum responding to a question from Commissioner Moore after the June 15, 2006, staff briefing. Additional information about enforcement and monitoring under the proposed rule was provided to the Commission at a closed briefing in January 2008.

C. SUMMARY: COMMISSION-DIRECTED ACTIONS

Chart 1 on the next page summarizes the staff's progress on the Commission-directed actions. The staff anticipates completing its work on the Commission-directed actions by the end of June 2008, with the exception of additional work on maximum speed which is described below and has been funded for FY 2008. The staff plans to continue its work on these activities with a target completion date of June 2008 for responding to all Commission-directed actions. At that time, the staff will provide a second status report to the Commissioners.

D. OTHER ONGOING ATV PROJECT ACTIVITIES

1. Analysis of NPR Comments

The Commission invited interested parties to submit comments on the August 10, 2006, NPR by October 24, 2006.[7] The staff has reviewed the comments, and a response to the comments will be included in the June 2008 status report.

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[7] The closing date was extended to December 26, 2006, as noted in "Standards for All Terrain Vehicles and Ban of Three-Wheeled All Terrain Vehicles: Extension of Comment Period," 71FR, 61923 (October 23, 2006).

Chart 1
Status as of January 2008: Commission-Directed ATV Actions

ACTION/TASK	STATUS / EXPECTED FINISH DATE
Youth ATVs	
1. IDI Analysis	
• Pilot Study	Completed
• Pilot Study report	Completed
2. ATV Characteristics and 3. ATV Rider Interactivity	
• Vehicle Testing – Aberdeen	June 2008
• Vehicle Testing – Report	June 2008
• Trips to NHTSA and ATV Plants	Completed
• Trip Reports	Completed
4. Appropriate Weight and 5. Appropriate Speed	
• Publish 2 RFIs	Completed
• Review submitted responses to RFIs	Completed
• Summary memorandum	Completed
6. ATV Training: Structure for three age groups	
• Contact outside organizations	June 2008
• Staff memorandum	June 2008
7. Tandem Youth ATVs: Appropriateness	
• OGC memorandum	Completed
8. Illumination	
• Determining data existence / availability	June 2008
• Staff memorandum, with recommendation	June 2008
ATVs in General	
1. *Different I&E campaigns for parents and children*	
• Staff memorandum, with recommendation	June 2008
2. *Feasibility: Requiring Pre-purchase training*	
• Staff memorandum	Completed
3. *Review/ revise incident reporting form*	
• Review current incident reporting form /IDI form	June 2008
• Prepare memorandum for Commission review	June 2008
4. *New tab on www.atvsafety.com*	
• Develop information for tab	Completed
• Incorporate tab on Web site	Completed
5. *Enforcement and Monitoring under Proposed Rule*	
• Staff memorandum	Completed

CPSC received comments to the NPR dealing with the proposed rule's maximum speed of 30 miles per hour or less for youth ATVs. The comments specifically suggest that one category of youth ATVs have a maximum speed capability of 38 miles per hour or less. (This maximum speed is the speed that is allowed by the revised voluntary standard, ANSI / SVIA 1-2007.) Further, as noted above (under Youth Models, Action 5), the Commission has directed the staff to conduct research to determine if the top speed of 30 miles per hour for the teen youth model is excessive.

As noted previously[8], the ESHF staff found "no scientific research to support either raising or lowering the current 30 miles per hour speed limit for teens." To *begin* to respond to the Commission-directed action and the speed-related comments submitted in response to the NPR, ESHF staff will conduct focus groups and one-on-one interviews with children, parents who ride ATVs and have children who ride ATVs, and parents who do not ride but allow their children to ride ATVs. Because this task will be contracted out and will require approval of a questionnaire and survey by the Office of Management and Budget, the time-to-completion could be several months to a year. FY 2008 funds have been provided for the focus groups and one-on-one interviews. Tab D provides further information about these activities.

Also, as noted in Tab D, the ESHF staff will use the existing CPSC Consumer Opinion Forum to ask questions of ATV owners and non-owners; the Forum will be particularly useful for reaching a large number of people and asking them questions that may arise from the focus groups and the one-on-one interviews.

2. Information and Education Activities

The CPSC Office of Public Affairs (EXPA) staff continues to develop educational programs and activities intended to reduce injuries and deaths associated with ATVs. In 2007, EXPA staff implemented the Rapid Response program, by which CPSC staff provided real-time responses, such as TV and /or radio PSAs and one-page fact sheets, to local communities where an ATV incident had occurred. In addition, EXPA staff was responsive to national and local press requests for information and interviews. Tab G provides more information about EXPA's activities.

3. Office of Compliance Activities

The Office of Compliance has provided a memorandum that discusses compliance staff activities for the period May 2006 through November 2007. These activities have included recalls, age monitoring investigations, monitoring for compliance with the voluntary standard, and reviewing voluntary letters of undertaking. This memorandum contains proprietary information and will be provided separately.

4. 2006 Annual Report of ATV-Related Deaths and Injuries

The CPSC Directorate for Epidemiology (EPHA) staff has completed the *2006 Annual Report of ATV-Related Deaths and Injuries.*

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[8] "ATV Age Guidelines," memorandum from Hope E. Johnson, Engineering Psychologist, Division of Human Factors, Directorate for Engineering Sciences, CPSC, to Elizabeth Leland, Project Manager ATV Team, May 23, 2006, p. 4.

5. Status of Voluntary Standard Activities

The staff continues to monitor developments related to the voluntary standard. On July 23, 2007, the standard for all-terrain vehicles, ANSI / SVIA -1- 2007, was approved by ANSI. This revised standard builds on prior versions of the standard and continues to address design, configuration, and performance aspects of ATVs. New areas covered by this revision include: definition and requirements for Type II (tandem) ATVs; requirements for labels, owner's manuals, hang tags, and a compliance certification label for all ATVs; and a category 'Y-10' and a category 'T' ATV as Type I (single-rider) ATVs. The category 'Y-10' ATV is a youth model intended for use by children age 10 and older. The category 'T' ATV is a transitional ATV intended for recreational use by an operator age 14 or older under adult supervision or by an operator age 16 or older.

The proposed mandatory rules for three-wheeled and four-wheeled ATVs, as published in the August 10, 2006, NPR differ from the current revised voluntary standard, ANSI / SVIA 1-2007. The major areas in the CPSC NPR that differ from the voluntary standard are: ATV age categories; maximum speed for youth ATVs; inclusion of offer-of-training requirement; wording and design of labels; inclusion of risk disclosure form; and lighting equipment provisions for youth ATVs.

6. Tracking of Market Developments

The domestic market for ATVs is dynamic and in the past few years has been marked by the entrance of large numbers of imports from China that do not comply with the voluntary standard; the entrance of smaller adult models of ATVs (in the 110cc to 250cc range); new types of sales networks; new types of four-wheeled vehicles, including utility vehicles and recreational vehicles; and new types of three-wheeled vehicles. Staff is continuing to keep abreast of these changes in the market and their potential impact on the use of four-wheeled ATVs.

7. Testing at Aberdeen

Staff plans to continue ATV testing at Aberdeen in FY 2008. At the current time, staff plans to: test and evaluate mid-size adult ATVs, because these may become the next generation of Category T ATVs; test and evaluate full-size ATVs that are involved in injuries and fatalities to children (the majority of injuries and deaths of children under 16 years of age occur on adult ATVs); examine the effect of rider interaction on full-size adult ATVs; and examine the latest technology on ATVs such as power steering and independent rear suspension. Testing of adult ATVs will not begin until analysis and evaluation of the youth ATV testing at Aberdeen has been completed.

8. Laboratory Sciences (LS) Research and Development Work

CPSC LS staff is developing an "autonomous ATV"; this work consists of developing a system to remotely control an ATV so that its stability under a variety of operational conditions can be evaluated safely. Autonomous ATV testing will allow ES staff to perform repeatable tests (that may be too dangerous to perform with a test operator) to evaluate off-road vehicle stability.

9. Incident Reconstruction Work

As described in Tab D, a staff team of mechanical engineers, human factors engineers, and field investigators will visit about 10 incident sites in FY 2008 to undertake incident reconstruction work and interview survivors of ATV incidents. These visits will include more accident reconstruction work than is conducted during routine CPSC investigations and will provide additional insight into behavior and motivation of ATV riders, as well as physical actions and ATV response leading to the incident.

E. SUMMARY: OTHER ATV PROJECT ACTIVITIES

Chart 2 on the next page summarizes the status of other ATV-related activities that will be carried out in the remainder of FY 2008. Many of these are activities that will continue *throughout* the fiscal year on an ongoing basis. Others are completed once every fiscal year (e.g., the annual report of deaths and injuries), while others, started in FY 2008, might continue into FY 2009 (e.g., focus groups and one-on-one interviews). Staff plans to continue its work on these activities.

Chart 2
Status as of January 2008: Other ATV Project Activities

ACTIVITY	STATUS / EXPECTED FINISH DATE*
1a. NPR Comments	
• Review Comments	Completed
• Response Memorandum	June 2008
1b. Research: Maximum Speed	
• Focus Groups	FY 2008 or FY 2009
• Interviews	FY 2008 or FY 2009
2. Information and Education	
• Rapid Response	Ongoing
• atvsafety.gov Updating	Ongoing
• Requests: Interviews/Information	Ongoing
• ATV Safety Summit	FY2008 or FY 2009
3. Office of Compliance Activities	
• Recalls	Ongoing
• Age Monitoring Investigations	Ongoing
• Monitoring: Compliance with Voluntary Standard	Ongoing
4. EPHA Annual Report: Deaths and Injuries	
• 2006 Report	Completed
5. Laboratory Sciences Work	
• "Autonomous" ATV	June 2008
6. Monitoring Voluntary Standard Activities	Ongoing
7. Tracking Market Developments	Ongoing
8. Testing at Aberdeen (Adult ATVs)	FY 2008 or FY 2009
9. Incident Reconstruction Work	Ongoing

* Many of these activities are activities that continue throughout the fiscal year on an ongoing basis. Others occur once every fiscal year (e.g., the annual report of deaths and injuries), while others that are one-time activities (such as focus groups) may need to continue beyond FY 2008.

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UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
4330 EAST WEST HIGHWAY
BETHESDA, MD 20814

Memorandum

Date: February 12, 2008

TO : Elizabeth W. Leland, Project Manager
Directorate for Economic Analysis

THROUGH: Russell H. Roegner, Ph.D. RR
Associate Executive Director, Directorate for Epidemiology

Kathleen Stralka, M.S.
Director, Division of Hazard Analysis

FROM : Robin A. Streeter, Ph.D.
Mathematical Statistician, Division of Hazard Analysis

SUBJECT : Pilot Study on ATV Youth Deaths*

Introduction

To address the risks of injury and death associated with all-terrain vehicles (ATVs), the U.S. Consumer Product Safety Commission (CPSC) issued a Notice of Proposed Rulemaking (NPR) in 2006 (*Federal Register*, Vol. 71, No. 154 (*FR* 71:154), pages 45904 – 45962, August 10, 2006). In approving the NPR for release, the Commission instructed CPSC staff to conduct several tasks that would help the Commission better understand issues related to youth model ATVs (i.e., ATVs that have engine displacements less than or equal to 90 cubic centimeters (cc's) and that are intended for operators younger than 16 years of age). Two of these tasks involved review of available in-depth investigation (IDI) reports and other data collected by CPSC's Directorate for Epidemiology in order to assess factors associated with ATV-related deaths and injuries among youth. With regard to youth ATVs, the Commission's specific charges involving incident review were:

> Analyze all in-depth investigation reports and any other detailed reports of injuries we may have [involving] children on ATVs to determine what factors contributed to the incidents and to determine whether additional changes could be made to the operational/handling characteristics of youth ATVs that would reduce or eliminate injuries and deaths due to those factors. (*FR* 71:154, p. 45929, Section P/Number 1)
>
> Analyze CPSC data to determine the desirability of illumination on youth ATVs (in both daytime and nighttime situations) to reduce deaths and injuries to riders. (*FR* 71:154, p. 45929, Section P/Number 8)

*This analysis was prepared by CPSC staff. It has not been reviewed or approved by, and may not reflect the views of, the Commission.

The CPSC staff ATV team sought to address the Commissioners' questions through a pilot study involving approximately 100 IDI reports. Three specific objectives were defined for this pilot study:

1. Determine what factors contributed to injury/fatality incidents involving youths (children under 16 years of age) operating ATVs.

2. Determine whether there are changes that can be made to the operational/handling characteristics of youth ATVs to reduce injuries and deaths.

3. Assess the desirability of illumination on youth ATVs.

The pilot study was conducted from January 2007 through July 2007. This memorandum describes the methodology used to conduct the pilot study together with the results of that effort. The memorandum then discusses how the findings address each of the pilot study objectives, and closes with a short summary of the major conclusions from the pilot study.

Methodology

CPSC staff utilized the following steps in conducting the pilot study:

- *Establish a multidisciplinary group to conduct the pilot study (the pilot study subteam)*

The pilot study subteam included CPSC staff representatives from Mechanical Engineering, Human Factors, Health Sciences, Economics, Compliance, Public Affairs, and Epidemiology.

- *Select approximately 100 IDI reports for review*

CPSC field staff investigates nearly all ATV-related fatalities that are reported to CPSC via any source (e.g., news clip, consumer report, medical examiner's report, death certificate, etc.). However, CPSC staff conducts very few investigations of ATV-related injuries. For this reason, the pilot study relied on IDIs for ATV-related deaths. In selecting the specific IDIs to review, the pilot study subteam defined two criteria:

(i) Select IDIs from the most recent year for which the data are publicly available (2005), in order to provide information to the Commission that is as current as possible and that might reflect changes in the ATV market during the past few years; and

(ii) Select IDIs involving a youth operator, since these incidents would be the most likely to involve a youth model ATV. Staff considered it likely that only a very few, if any, recent ATV-related fatality incidents involved adults on youth model ATVs, and that, even if such incidents did occur, these kinds of incidents would not provide information that was directly relevant to the Commission's instruction.

The pilot study utilized all 103 of the 2005 fatality incidents involving youth operators that were available for and included in the most recent cleared ATV annual report (i.e., the *2005 Annual Report of ATV Deaths and Injuries/Amended*, February 2007). These 103 fatality incidents constituted the pilot study data set.

- *Determine the specific information to be collected during the IDI review*

CPSC staff first identified the categories of information needed to address each of the three pilot study objectives (Appendix A). This information fell into two broad types of data: descriptive data and interpretive data. Descriptive data included general information regarding the incident itself (e.g., date, time of day, location, etc.), as well as information regarding the decedent(s), the ATV operator(s), the ATV and its equipment, the environment or setting where the incident occurred, and the event (e.g., the hazard pattern, the number of riders on the ATV, etc.). Interpretive data involved the identification of factors that may have influenced the event (e.g., speed), and factors that may have prevented the event (e.g., riding without passengers).

- *Develop an incident review form for use by the subteam*

The subteam then developed a detailed incident review form (Appendix B) for use by the subteam members in reviewing the IDIs. This review form included all of the information categories described above and listed in Appendix A (i.e., general incident characteristics, decedent information, ATV operator information, ATV equipment characteristics, environment characteristics, event characteristics, and event/prevention analysis factors). Prior to its implementation, the IDI review form was reviewed by the CPSC staff ATV team.

- *Conduct the IDI review*

Each subteam member reviewed each of the 103 IDIs and provided input to the Directorate for Epidemiology/Division of Hazard Analysis (EPHA). EPHA staff then compiled the information and identified items where the subteam members had conflicting input. The pilot study subteam held a series of meetings throughout the review process to discuss the IDIs and resolve conflicting input.

- *Tabulate, code, and analyze the data from the group IDI review*

EPHA staff summarized all of the collected data for the 103 IDI reports and conducted a series of analyses using the compiled data. Preliminary results were distributed to the pilot study subteam for further review and discussion. Following the compilation of the preliminary results, the pilot study subteam re-reviewed the hazard pattern for each incident to ensure coding consistency over the full pilot study data set.

- *Prepare a preliminary summary of key points and a pilot study memorandum*

A preliminary summary of the key points from the pilot study was prepared and issued for review and clearance (August 2007). Following preparation of the preliminary summary, this more detailed memorandum has been developed to describe the results and conclusions from the pilot study.

Results

This section summarizes the main results of the pilot study with respect to each of the categories of data collected: general incident characteristics, decedent characteristics, ATV operator characteristics, ATV equipment characteristics, event characteristics, and event/prevention analysis factors.

General Incident Characterstics

As noted, the pilot study involved the review of detailed IDI reports for 103 fatality incidents. Of these 103 incidents, 85 incidents were determined to be in scope for the purposes of the pilot study, and 18 incidents were classified as out of scope based on the following:

- The type of vehicle (i.e., utility vehicle[1] or 3-wheel[2] model) was not relevant to the pilot study objectives (n = 9);
- The year of death had been incorrectly identified as 2005 (n = 2); or
- The incident hazard pattern did not relate directly to the operational or handling characteristics of the ATV (n = 7). These included the following hazard patterns:
    - 2 incidents where a toddler (2 – 3 years old) grabbed the ATV throttle, and the sudden acceleration caused a fatal accident;
    - 2 incidents where a passenger intentionally jumped from a moving ATV and was fatally injured;
    - 1 incident where an ATV fell through the ice on a frozen pond;
    - 1 incident where it appeared that the youth operator may have been trying to float on the ATV in a river; and
    - 1 incident where a youth-operated ATV knocked over a tree, and the tree fell on a 2-year-old bystander.

Of the 85 in-scope incidents:

- 2 incidents involved known or suspected youth ATVs;[3]
- 3 incidents involved known or suspected tandem ATVs;
- 2 incidents involved known or suspected new-entrant import models;[4]
- 8 incidents involved 2 fatalities [total fatalities = 93; note that each of these 8 incidents involved only 1 ATV and, in each of these 8 incidents, both the ATV driver and the ATV passenger were fatally injured];

[1] For the incident data analysis, an ATV was defined as a motorized vehicle designed for off-road use and having 3 or 4 broad, low pressure tires, a straddle seat, and handle bars. Vehicles with bench seats and/or steering wheels (e.g., utility vehicles) were not considered ATVs for the purposes of the pilot study.

[2] For the purposes of the pilot study, incidents involving ATVs with 3 wheels were considered out of scope. Incidents involving these models were considered unlikely to be informative regarding the operational and handling characteristics of 4-wheel ATVs, including youth models.

[3] A third incident involved a 1980's model 4-wheel ATV with an engine displacement of 85 cc's. However, because this model was manufactured before the advent of ATV models intended specifically for operators younger than 16 years of age (i.e., youth ATVs), this ATV was not considered a youth ATV.

[4] The new-entrant import models involved in these incidents had engine displacements greater than 90 cc's, and thus were not considered youth ATVs.

- 4 incidents involved 2 ATVs colliding [total ATVs = 89; note that each of these 4 incidents involved only 1 fatality]; and

- No incidents involved both 2 fatalities and 2 ATVs colliding.

The in-scope incidents occurred in 36 states. Collectively, these states represented all regions of the U.S., including the Pacific Northwest (e.g., Oregon), the West (e.g., California), the Southwest (e.g., New Mexico), the Mountain States (e.g., Colorado), the Midwest (e.g., Kansas), the South (e.g., Louisiana), the Mid-Atlantic (e.g., Pennsylvania), and New England (e.g., New Hampshire). In-scope incidents also occurred in all seasons of the year, with the largest portion [40/85 or 47 %] of the in-scope incidents occurring in summer.

General incident characteristics are summarized in Tables 1 – 3.

Table 1: Incident summary		
Incident reports (IDIs) reviewed:		103
Incidents determined to be in scope:		85
Out-of-scope incidents:		18
- Incident involved a utility vehicle	6	---
- Incident involved a 3-wheel ATV	3	---
- Fatality occurred in 2004	2	---
- Hazard pattern not relevant to pilot study	7	---
Notes: All numbers are incident counts		

Table 2: In-scope incident summary by season	
Season	**Number of Incidents**
Spring (March, April, May)	19
Summer (June, July, August)	40
Fall (September, October, November)	15
Winter (December, January, February)	11

Table 3: States with 3 or more in-scope incidents	
State	**Number of Incidents**
Georgia	6
Pennsylvania	6
Oklahoma	5
Florida	4
Michigan	4
Mississippi	4
Tennessee	4
West Virginia	4
California	3
Illinois	3
Missouri	3
New Mexico	3
Oregon	3
Notes: Total number of states with in-scope incidents: 36 (Alabama, Alaska, California, Colorado, Florida, Georgia, Illinois, Indiana, Kansas, Kentucky, Louisiana, Maine, Maryland, Michigan, Minnesota, Mississippi, Missouri, Montana, New Hampshire, New Jersey, New Mexico, North Carolina, North Dakota, Nebraska, Nevada, New York, Ohio, Oklahoma, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Virginia, Wisconsin, and West Virginia).	

Decedent Characteristics

As noted previously, 8 of the 85 in-scope incidents involved 2 fatalities, resulting in a total of 93 decedents [n = 93] for whom data were compiled. The majority of these decedents were male [71/93 or 76 %], and the majority were 12 – 15 years old[5] [51/93 or 55 %]. The majority of the decedents were ATV operators [69/93 or 74 %].

Where helmet use was known, 34 % of the decedents wore helmets [28/82]. However, for 7 of these 28 victims, the decedent's helmet came off during the event. In at least 1 of the 7 incidents where the victim's helmet came off, it appeared that the helmet was not buckled correctly. In the remaining 6 incidents, it is unknown whether the helmet did not fit properly and/or was not worn properly (e.g., it may not have been securely buckled), or whether the helmet was ejected from the victim's head as a result of forces created during the incident. These 6 incidents all involved collisions with either a stationary object (e.g., a tree), an off-road vehicle (e.g., a snowmobile), or a highway motor vehicle (e.g., a dump truck).

[5] For the purposes of the analyses, the pilot study considered 3 age groups: younger than 6 years of age, 6 – 11 years old, and 12 – 15 years old. Selection of these age groups is consistent with the age groups considered in CPSC's current safety guidelines (http://www.atvsafety.gov/children_tip.html).

Decedent characteristics are summarized in Tables 4 and 5.

Table 4: Decedents by age and gender			
Age Group	**Males**	**Females**	**Total**
< 6 years	2	1	3 (3 %)
6 - 11 years	30	6	36 (39 %)
12 - 15 years	37	14	51 (55 %)
> 15 years	2	1	3 (3 %)
Total	71 (76 %)	22 (24 %)	93
Notes: (1) 8 of the 85 in-scope incidents involved 2 fatalities. (2) 3 in-scope incidents involved an adult passenger (≥ 16 years old) on a youth-operated ATV.			

Table 5: Decedents by ridership status	
Ridership Status	**Number of Decedents**
Driver	69 (74 %)
Passenger	21 (23 %)
Bystander	1 (1 %)
Driver of other vehicle	1 (1 %)
Unknown	1 (1 %)
Total	93
Notes: (1) 8 of the 85 in-scope incidents involved 2 fatalities.	

ATV Operator Characteristics

As noted, the in-scope incidents involved a total of 89 ATVs [n = 89]. Gender was known for 88 of the ATV operators and age was known for 87. The majority of ATV operators were male [67/88 or 76 %], and the majority were 12 – 15 years old [55/87 or 63 %]. These results are consistent with the decedent characteristics discussed in the previous subsection (i.e., the majority of decedents were ATV operators, male, and between the ages of 12 and 15).

Often, the available police and medical reports that constitute the IDIs did not include detailed toxicology reports to assess alcohol and drug use by the ATV operators. However, among the 63 incidents where some information was available regarding possible alcohol and/or drug use by the ATV operator(s), the use of alcohol and/or drugs was known or suspected in only 2 incidents.

The available police and medical reports also included very little information regarding whether the ATV operators had received ATV training, and, if so, the type of training that had been provided. Indeed, in only 1 incident was it considered likely the ATV operators[6] had received formal training. However, the reports for 21 of the remaining 84 in-scope incidents suggested that the ATV operator(s) had received some degree of informal training in the basic operation of

[6] This incident occurred at an ATV racetrack, and involved 2 ATVs colliding.

the ATV.[7] Reports for the remaining 63 incidents contained no information regarding possible informal training received by the ATV operator(s).

ATV operator characteristics are summarized in Table 6.

Table 6: ATV operators by age and gender

Age Group	Males	Females	Unknown Gender	Total
< 6 years	1	---	---	1 (1 %)
6 – 11 years	27	3	---	30 (34 %)
12 – 15 years	37	18	---	55 (62 %)
≥ 16 years(1)	1	---	---	1 (1 %)
Unknown age	1	---	1	2 (2 %)
Total	67 (75 %)	21 (24 %)	1 (1 %)	89

Notes:
(1) In one in-scope incident involving 2 ATVs, the operator of one ATV was a 10-year-old female and the operator of the 2nd ATV was a 19-year-old male.
(2) Percentages in this table are based on the total number of ATV operators (89), including one adult operator (i.e., the 19-year-old male; see note (1)), one male youth operator of unknown age, and one operator of unknown gender and age.

ATV Equipment Characteristics

The 85 in-scope incidents involved a total of 89 ATVs (i.e., 4 incidents involved 2 ATVs). Only two of these ATVs were identified as known or suspected youth models. The remaining 87 appeared to be full-size, adult ATVs [87/89 or 98 %]. Three ATVs were identified as known or suspected tandem models, and 2 ATVs were identified as known or suspected new-entrant import models. Both of the ATVs identified as known or suspected new-entrant import models had engine displacements greater than 90 cc's.

Where model type was known, more than two-thirds of the adult, single-rider ATVs were utility models rather than sport models [45/64 or 70 %]. Where engine size was known, 3 % [2/67] had engine sizes less than or equal to 90 cc's and 6 % [4/67] had engine sizes between 91 and 200 cc's. More than 90 % of the ATVs with known engine size had engine displacements larger than 200 cc's [61/67 or 91 %]. One-fourth of the ATVs with known engine size had engine displacements larger than 450 cc's [17/67 or 25 %].

In the majority of cases, the ATV appeared to be owned by the victim, the victim's family or by a friend or neighbor of the victim [61/89 or 69 %]. ATV ownership was unknown for 28 of the 89 ATVs [28/89 or 31 %]. However, based on information in the IDIs, including information regarding the incident setting, none of the in-scope incidents appeared to involve a rented ATV.

Environment Characteristics

Roadways[8] constituted the most common setting for the 93 fatalities. Nearly 30 % of the in-scope incidents with known terrain surface involved riding on paved roads [23/82 or 28 %]. An

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[7] The pilot study subteam defined informal training as instruction that an ATV operator received from a person (typically a friend or family member) who was familiar with at least some aspects of the operation of the ATV. For example, if the police report stated that a parent had shown the operator how to start and stop the ATV, that was considered informal training by the pilot study subteam.

additional 30 % of in-scope incidents involved riding on unpaved roadways [25/82]. Of the 3 incidents where terrain surface was unknown, at least 2 involved riding on roadways, although it could not be determined whether the road surface was paved or unpaved.

Other common settings included farm pastures and residential yards. Three in-scope incidents occurred in off-road desert recreational areas where ATV riding is common. One in-scope incident occurred at a public ATV race track. Where terrain grade was known, more than 50 % of the in-scope incidents involved riding on sloped ground or on uneven terrain characterized by dips, holes, ruts, etc. [38/60 or 63 %].

Where time of day was known, the majority of incidents occurred in the late afternoon or early evening between the hours of 4:00 p.m. and 8:00 p.m. [45/81 or 56 %]. Another 28 % of the incidents occurred between the hours of noon and 3:00 p.m. [23/81 or 28 %]. Nine incidents were reported to have occurred in the morning between the hours of 8:00 a.m. and noon [9/81 or 11 %], and 4 incidents were reported as occurring at night between the hours of 9:00 p.m. and 2:00 a.m. [4/81 or 5 %].

Where weather conditions were known from the police report, sheriff's report, or other document, the majority of incidents were reported to have occurred when there were no known adverse weather conditions [56/65 or 86 %]. Information from police or other reports indicated that 8 of the incidents occurred when it was cloudy, although it was not clear that the cloudy conditions played a role in any of these incidents. Only one of the incidents was reported to have occurred when it was snowing. None of the incidents were reported to have occurred when it was raining.

Event Characteristics
Of the 85 in-scope incidents, 8 incidents involved 2 fatalities [8/85 or 9 %] and 4 incidents involved 2 ATVs [4/85 or 5 %]. None of the incidents involving 2 ATVs involved 2 fatalities.

Where the number of riders on the ATV was known, more than one-third of the in-scope incidents involved multiple passengers on an ATV [33/84 or 39 %]. Of these 33 incidents, none involved a known or suspected tandem ATV. In 28 of the 33 in-scope incidents where there were multiple riders on the ATV, both the operator and the passenger (or passengers) were under 16 years of age [85 %].

More than one-third of the in-scope incidents involved collisions [34/85 or 40 %]. The collisions were broken down as follows:

- 38 % of the collisions involved a stationary object (e.g., tree, fence, parked car, curb, etc.) [13/34];

- 38 % of the collisions involved a moving highway motor vehicle (e.g., car, pick-up truck, dump truck, etc.) [13/34];

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[8] Roadways were defined to include settings with the potential for highway motor vehicles (including cars, pickup trucks, dump trucks, etc.) to be operating. Under this definition, roadways included both public and private roads with either paved or unpaved surfaces.

- 21 % of the collisions involved a moving off-road vehicle (e.g., another ATV, dune buggy, dirt bike) [7/34]; and

- One collision involved a bystander.

Other hazard patterns included:

- Failure to turn or missing a turn in the roadway/trail with subsequent collision, overturning and/or ejection of the victim from the ATV [9/85 or 11 %];

- Encountering rough, changing or uneven grade,[9] with subsequent overturning and/or ejection of the victim from the ATV [27/85 or 32 %]; and

- Overturning on apparently level ground; in these incidents, there was no known or reported change in grade nor was there a known collision preceding the overturning [11/85 or 13 %].

- Ejection of the victim without overturning of the ATV or where it was unknown if the ATV overturned [3/85 or 4 %]; very little was known about these incidents except that the victim was thrown, fell, or jumped from the ATV.

- The hazard pattern for 1 incident was unknown.

Of the 89 ATVs involved in the in-scope incidents, a review of the hazard patterns together with information contained in the available police reports suggested that 47 ATVs may have sustained at least minor damage [53 %]. It appeared that only 6 of the ATVs had no damage. Damage to the remaining 36 ATVs involved in the in-scope incidents could not be determined.

Short hazard summaries are provided for each of the 103 IDIs reviewed by the pilot study subteam in Appendix C.

Tables 7 and 8 summarize key event characteristics.

Table 7: Number of riders on ATV

Number of Riders	Number of Incidents	Percentage
1 rider (driver only)	51	60 %
2 riders	30	35 %
3 riders	3	4 %
Unknown	1	1 %
Total	85	---

Notes:
(1) None of the 85 in-scope incidents were known to involve more than 3 riders on an ATV.

[9] Grade changes included inclined features such as banks, embankments, ravines, ditches, ruts, and dips.

Table 8: Summary of hazard patterns		
Hazard Pattern	**Number of Incidents**	**Percentage[1]**
Collision	34	40 %
Failure to turn[2]	9	11 %
Grade[3]	27	32 %
Overturn	11	13 %
Ejection	3	4 %
Unknown	1	1 %
Total	85	---

Notes:
(1) Percentages add to more than 100 % due to rounding.
(2) Failure to turn or missing a turn in the roadway/trail with subsequent collision, overturning and/or ejection of the victim from the ATV.
(3) Encountering rough, changing or uneven grade, with subsequent overturning and/or ejection of the victim from the ATV.

Event/Prevention Analysis

A number of factors were considered as part of the event/prevention analysis (see Appendix B). However, in many incidents, little if any information was available for the majority of factors considered. This section discusses the available data for five factors of common interest: permission, supervision, visibility, speed, and whether helmet use would have prevented the fatality.

Permission

Permission is a complicated issue for youth operators, involving not only permission by the child's parent (or person acting *in loco parentis*) but also permission by the ATV owner (who may not be the operator's parent). In some instances where details of the events leading up to the incident were available, it appeared that operators had limited or conditional permission to ride the ATV at the time of the incident, but may not have had permission to engage in the specific riding activity that preceded the incident. For example, an operator may have been told to ride only in the field next to the operator's house, and explicitly told not to ride on the road where the incident occurred. In only 5 of the 85 in-scope incidents did the ATV youth operator(s) apparently not have permission to ride the ATV. In 51 incidents, it appeared likely that the operator(s) perceived that he/she/they had at least conditional permission to ride the ATV, although there may have been restrictions placed on that activity (e.g., do not ride in the street), and in 29 incidents, no information regarding permission could be discerned from the IDI reports.

Supervision

Like permission, supervision is a multi-faceted issue, making it challenging to assess in a study such as this. Analysis of supervision required not only determining who was present at the time of the incident, but also evaluating whether that person(s) was (were) actively engaged in overseeing the actions of the youth ATV operator. For the purposes of this analysis, supervision constituted a non-youth (i.e., a person 16 years or older) who was present and who was expected to have been able to observe and communicate with the youth operator at the time of the incident. Under this definition, 54 of the 85 in-scope incidents were considered by the subteam to be unsupervised (i.e., there was no supervision or supervision was considered unlikely, given the circumstances of the incident). Of the 31 remaining in-scope incidents, 14 were classified as having supervision. In 17 incidents, it was unknown whether the youth ATV operator was supervised at the time of the incident.

Visibility

Assessing whether the visibility of a potential hazard played a role in a given incident involves a number of factors, including time of day, season of the year, latitude of the incident location, and weather. Visibility can also be affected by setting (e.g., shaded woodland vs. open field), and physical obstructions present in the vicinity of the incident location (e.g., overgrown grass obscuring a ditch or a dip in the trail). In only 20 incidents was a factor identified that may have limited the ATV operator's ability to see a potential hazard and thus may have been a potentially contributing factor in the incident. These factors included curves, dips, and hills in the roadway or trail that may have obscured visibility as well as factors like darkness (i.e., night time), dust, and vegetation that may have limited visibility. In the remaining incidents, it was unknown whether any factor limited the operator's ability to see a hazard.

Speed

In more than three-quarters of the in-scope incidents where information regarding ATV speed could be assessed from the official reports, it appeared that the ATVs were operating at the time of the incident at speeds that were too fast for conditions [42/55 or 76 %]. Thus, in these incidents, speed may have played a role. In 13 incidents, speed did not appear to play a role in the incident. In the remaining 30 incidents, the role of speed could not be assessed. It must be emphasized that rigorous estimates of the ATVs' speed at the time of the incident were not available. Consequently, as with information on permission, supervision, and visibility, the collection of information on speed involved some level of speculation.

Prevention Analysis: Helmet Use

At least 53 of the decedents did not wear helmets [53/92[10] or 58 %]. In 7 incidents, the victim was apparently wearing a helmet, but the helmet came off during the incident [7/92[10] or 8 %]. Helmet use for the remaining decedents was classified as follows:

- 21 decedents were reported as wearing helmets at the time of incident, and their helmets were not reported as coming off during the incident [21/92[10] or 23 %]. For at least 6 of these 21 decedents, the cause of death involved chest trauma or multiple organ injury (i.e., injuries for which a helmet offers no protection), and for at least 7 of these 21 decedents, the cause of death involved head trauma (i.e., it is possible to sustain fatal head trauma even while wearing a helmet). For at least 2 of the 21 helmet-wearing decedents, the cause of death involved trauma to both the chest and the head (i.e., it is possible to sustain both fatal chest trauma and fatal head trauma).

- Helmet use for the remaining 11 decedents was unknown [11/92[10] or 12 %[11]].

[10] Helmet use for 1 of the 93 decedents was considered not applicable; in this incident, the helmetless decedent, a 5-year-old child, was playing in a friend's yard when he was struck by a youth-operated ATV.
[11] Percentages do not sum to 100 % due to rounding.

Assessing whether the use of a properly-sized and properly-worn helmet would have prevented the death of decedents who did not wear a helmet or whose helmet came off during the incident involves analysis not only of helmet use but also analysis of both hazard pattern and cause of death, including contributing causes of death. These may not be known, especially in the absence of a detailed autopsy report. In addition, even in cases where a helmetless victim sustained a fatal head injury, it cannot be known with certainty whether wearing a helmet would have saved the victim's life. Indeed, as noted above, it is possible to sustain fatal head trauma even when wearing a helmet.

Discussion
This section considers the results of the pilot study as they relate to each of the three specific objectives established for the pilot study. This section concludes with a short discussion of the strengths and limitations of the pilot study.

Objective 1: Determine what factors contributed to incidents involving youth operators on ATVs
Table 9 summarizes the hazard patterns by ATV operator age group.[12]

Table 9: Hazard patterns by ATV operator age group

Hazard Pattern	**< 6 yo**	**6 – 11 yo**	**12 – 15 yo**	**Unknown**	**All ages**
Collision	---	9	25	---	34 (40 %)
Failure to turn	---	---	9	---	9 (11 %)
Grade	---	13	14	---	27 (32 %)
Overturn	1	8	2	---	11 (13 %)
Ejection	---	---	2	1	3 (4 %)
Unknown	---	---	1	---	1 (1 %)
Total	1 (1 %)	30 (35 %)	53 (62 %)	1 (1 %)	85

Notes:
(1) yo – years old.
(2) Percentages do not sum to 100 % due to rounding.

Further discussion of the incidents observed in each age group is presented below. In considering the results of this analysis, it must be emphasized that the pilot study data set does not represent a statistically-derived sample of ATV-related fatality incidents. Thus, the results must be interpreted with caution. However, the hazard patterns and other incident characteristics discussed below provide insight into the types of incidents associated with each age group.

ATV Operators/Ages 3 – 5:
Only 1 in-scope incident involved an ATV operator in this age group. In that incident, the hazard pattern was determined to involve overturning on level ground. No other details regarding the hazard pattern associated with this incident were available. However, it was known that the operator did not have permission to ride the ATV at the time of the incident and that this incident involved an ATV with an engine displacement between 201 and 450 cc's. Because only a single incident was available, the typical hazard pattern(s) for this age group cannot be assessed from the pilot study.

[12] For incidents involving 2 ATVs, the analyses described in this section were conducted using information for the youngest ATV operator in the incident.

It is important to note that two incidents involving operators in this age group were categorized as out of scope for the purposes of the pilot study. Both of these incidents involved a toddler who grabbed the ATV throttle unexpectedly while riding an ATV in the company of an older family member (i.e., adult cousin, nine-year-old step-brother). Although these incidents did not provide information regarding the operational and handling characteristics of ATVs (and, thus, were considered out of scope for the purposes of the pilot study), these incidents do suggest a possible expansion of CPSC's current safety message regarding no passengers on non-tandem ATVs to include an explicit caution against anyone of any age giving rides to toddlers or young children.

ATV Operators/Ages 6 – 11:

In-scope incidents for this age group were distributed among three known hazard patterns:

- Collisions [9/30 or 30 %]; these collisions involved stationary objects [1/9], moving highway motor vehicles [5/9], moving off-road vehicles [2/9], and bystanders [1/9];
- Encountering rough, changing or uneven grade with subsequent overturning and/or ejection of the victim [13/30 or 43 %]; and
- Overturning on apparently level ground [8/30 or 27 %].

For the 30 incidents involving ATV operators in this age group, the operators in 22 of the incidents had at least conditional permission to ride the ATV. The permission status of the ATV operators in the remaining 8 incidents was unknown.

In 15 of the 30 incidents in this age group, it was unknown whether speed contributed to the incident. In 8 of the remaining 15 incidents, operating the ATV at a speed higher than appropriate for conditions was identified by the pilot study subteam as a potential contributing factor to the incident. In 7 of the 15 incidents where the role of speed could be assessed, speed was not identified as a contributing factor to the incident.

In 18 of the 30 incidents in this age group, it was unknown whether the operator was performing or trying to perform a stunt. Only 2 of the remaining 12 incidents in this age group appeared to involve an operator who was engaged in performing a stunt (e.g., wheelies, donuts, etc.), and 10 of the incidents did not appear to involve a stunt.

More than half of the 30 incidents in this age group involved an ATV with an engine displacement[13] between 201 and 450 cc's (17/30 or 57 %). Engine displacements for the remaining incidents in this group were broken down as follows:

- 1 incident involved a youth-sized ATV, with an engine size less than or equal to 90 cc's;
- 3 incidents involved ATVs with engine displacements between 91 and 200 cc's;

[13] In incidents involving 2 ATVs, the engine displacement for the ATV used by the youngest ATV operator is reported.

- 2 incidents involved ATVs with engine displacements between 451 and 600 cc's;

- 1 incident involved an ATV with an engine displacement greater than 600 cc's; and

- In 6 incidents, the ATV engine displacement was unknown.

ATV Operators/Ages 12 – 15:

Nearly 50 % of the in-scope incidents for ATV operators in this age group involved collisions [25/53 or 47 %]. In this age group, collisions involved stationary objects [12/25 or 48 %], moving highway motor vehicles [8/25 or 32 %], and moving off-road vehicles [5/25 or 20 %].

Other hazard patterns observed in this age group included the following:

- Failure to turn or missing a turn in a roadway or trail, with subsequent collision, overturning, and/or ejection of the victim from the ATV [9/53 or 17 %];

- Encountering rough, changing or uneven grade with subsequent overturning and/or ejection of the victim [14/53 or 26 %];

- Overturning on apparently level ground [2/53 or 4 %];

- Ejection of the victim without overturning or where it was unknown if the ATV overturned [2/53 or 4 %]; again, very little was known about these incidents except that the victim was thrown, fell, or jumped from the ATV; and

- Unknown hazard pattern [1/53 or 2 %]; in this incident, the source document (a news clip) contained few details about the incident and no official reports were able to be obtained.

For incidents involving ATV operators between the ages of 12 and 15, the ATV operators apparently had at least conditional permission to ride in 29 incidents. Only 3 incidents were identified as involving operators who apparently did not have permission to ride the ATV. In the remaining 21 incidents, insufficient information was available to assess permission.

In 33 incidents in this age group, speed was identified as a potential factor in the incident. In only 6 incidents did speed not appear to be a contributing factor, and in the remaining 14 incidents, information regarding the role of speed in the incident could not be assessed.

Information for 30 of the 53 incidents in this age group was not sufficient to determine whether the ATV operator was performing or trying to perform a stunt. Of the remaining 23 incidents in this age group, only 4 incidents appeared to involve stunts, and 19 did not appear to involve a stunt.

Of the 53 incidents in this age group, almost half involved an ATV with an engine displacement between 201 and 450 cc's (24/53 or 45 %). Engine displacements for the remaining incidents in this group were broken down as follows:

- 1 incident involved a youth-sized ATV, with an engine displacement less than or equal to 90 cc's;

- 1 incident involved an ATV with an engine displacement between 91 and 200 cc's;

- 8 incidents involved ATVs with engine displacements between 451 and 600 cc's;

- 5 incidents involved an ATV with an engine displacement greater than 600 cc's; and

- 14 incidents involved an ATV with an unknown engine displacement.

Objective 2: Determine whether there are additional changes to be made to the operational/handling characteristics of youth ATVs to reduce injuries and deaths
Only 2 of the in-scope incidents involved known or suspected youth ATVs. The hazard patterns associated with these 2 incidents involved the following:

- A collision with a moving motor vehicle on a paved, public road; and

- An ATV that overturned on apparently level ground.

Because of the small number of youth ATVs included in the pilot study data set, it was not possible to determine whether there are changes that could be made to the operational and/or handling characteristics of youth ATVs to reduce deaths.

Currently, IDIs are not routinely conducted for ATV-related injuries. It is not expected that a review of currently available injury incidents would help to address Objective 2 because, without IDIs, only very limited information (e.g., victim age, victim gender) would likely be available for these cases.

Objective 3: Assess the desirability of illumination on youth ATVs
It was not possible to answer this question from the information collected in the pilot study because of the very small number of known or suspected youth ATVs (n = 2) associated with in-scope incidents in the pilot study data set.

Strengths and limitations of the pilot study
This pilot study was characterized by several important strengths, including:

- The incident reports reviewed in the pilot study reflect the most recent data included in the latest cleared ATV annual report. (The pilot study was initiated in January 2007). This allowed the pilot study subteam to consider recent changes in the ATV market.

- The available incidents provide perspective regarding ATV use by children.

- The available incident reports span an entire year. Although more cases occurred in summer, the pilot study subteam was able to review incidents from all seasons. The observed seasonal distribution (Table 2) did not suggest any temporal clustering which, if present, could have limited the representativeness of the evaluated incidents. The observed seasonal distribution also appears to be generally consistent with the seasonal distribution of incidents among operators of all ages in a year for which data collection is complete.

- Reports were available for incidents occurring in all parts of the U.S. (Pacific Northwest, West, Southwest, Mountain States, Midwest, South, Mid-Atlantic, and New England). The observed geographic distribution did not suggest any spatial clustering, which, again, if present, could have limited the representativeness of the evaluated incidents. The observed geographic distribution also appears to be generally consistent with the spatial distribution of incidents among operators of all ages in a year for which data collection is complete.

- The incident reports involved youth operators who ranged in age from 3 years old to 15 years old, thus encompassing the complete age range of interest.

- The majority of incident reports included at least one official report (i.e., police report, medical examiner's report, coroner's report, etc.)

Building on these strengths, this anecdotal study suggests a number of factors that appear to be common to ATV-related fatality incidents involving youth operators. However, in most cases, the pilot study subteam was unable to explicitly determine causal factors which contributed to the incidents. Thus, the study did not fully address the Commissioners' questions. This is not a limitation of the study itself, but of the particular types of incidents involved and of the available data. Due to the nature of the fatalities and of the incidents, this information is frequently unattainable.

Related limitations associated with the data available for this study include:

- ATV-related injury incidents are not routinely investigated, and, consequently, the pilot study focused solely on ATV-related fatality incidents. However, it is recognized that injury incidents may involve different factors than fatality incidents.

- ATV-related fatality reporting for 2005 was ongoing at the time of the pilot study, and so the characterizations presented herein may change.

- The 103 incidents reviewed in the pilot study were not a statistically-derived sample of 2005 ATV-related fatalities involving youth operators. Thus, caution must be used in interpreting the results, particularly with regard to the relative frequencies observed in certain categories (e.g., the number of incidents involving a collision versus the number of incidents involving a failure to turn).

- Information collected by the subteam was based primarily on police and medical reports; the quality and completeness of these reports varies greatly across jurisdiction.

- The majority of the ATV-related fatality incidents were unwitnessed. In those events that were witnessed, the observers (often friends, parents, or siblings) may have found it hard to be impartial regarding the events surrounding the incident.

- In many instances, the person most familiar with the incident (i.e., the ATV operator) was deceased.

- The hazard patterns associated with ATV-related fatality incidents are often complex, involving a number of events. Thus, determining the precise sequence of events or identifying the most critical event in the hazard pattern sequence can be difficult and, in some cases, may not be possible.

- Much of the information requested by the Commissioners and sought by the subteam is not routinely collected in official reports. Examples of information that was not consistently reported include information on training, experience level, permission to ride the ATV, and supervision while riding.

- Much of the information sought by the pilot study subteam is inherently subjective. For example, what constitutes permission? What constitutes supervision? What constitutes a stunt? What constitutes training? The subteam worked hard to apply consistent criteria in assessing these factors. However, the subteam recognizes that it is possible that others reviewing the same data may reach different conclusions regarding these types of factors.

Conclusions

CPSC staff conducted this pilot study in response to instruction from the Commission to review data on recent incidents involving youth model ATVs. However, the in-scope fatality incidents reviewed in the pilot study involved only two known or suspected youth ATVs. As a consequence, the pilot study was not able to identify possible vehicle modifications that would improve the safety of youth ATVs. Results from testing that is being conducted by CPSC Mechanical Engineering staff may help to identify possible safety modifications for youth ATVs.

Because of the small number of youth ATVs represented in the pilot study data set, this study was also not able to assess the desirability of illumination on youth ATVs.

Although only 2 in-scope incidents involved youth ATVs, the reviewed incidents do provide important insight into the operation of ATVs by children younger than 16 years of age. The collected incident information will help to inform other ATV-related activities currently being conducted by the CPSC staff ATV team, including work being done by Mechanical Engineering. In addition, results of the pilot study might help in considering whether to tailor ATV rider training programs to specific age groups, as the Commission has directed the staff to do (*FR* 71:154, p. 45929, Section P/Number 7).

An important finding of the pilot study is that these results appear to underscore CPSC's existing ATV safety messages. The study results also suggest amplification of some existing safety messages as well as the possible development of several new ATV safety messages. Staff will consider the possible expansion of CPSC's existing ATV safety messages in light of the pilot study results together with findings from other activities currently being conducted by the CPSC staff ATV team.

Appendices

Appendix A: Development of Pilot Study on ATV Youth Deaths
Appendix B: IDI Review Form
Appendix C: Hazard Summaries

Appendix A: Development of Pilot Study on ATV Youth Deaths

Pilot Study Objective	Information Category	Information Type	Data collected	Possible topics for analysis
1. Determine what factors contributed to fatality incidents involving youths operating ATVs	General Incident Characteristics	Descriptive	Time of year, time of day, location, number of injured/deceased persons, number of vehicles involved	Do incidents appear to be more common at a certain time of year? Time of day? Part of US? Do incidents typically involve a single victim or multiple victims? Do incidents typically involve a single vehicle or multiple vehicles?
	Decedent Information	Descriptive	Age, gender, weight, height, ridership status, date of death, cause of death, alcohol usage, drug usage [for all decedents]; safety gear usage [for ATV riders only]	How are decedents distributed with respect to age and gender? How are decedents distributed with respect to ridership status? What are the common causes of death? Do decedents typically wear helmets? Other safety gear?
	Driver Information/ATV	Descriptive	Age, gender, weight, height, other information regarding driver size, training [formal and informal]	How are incidents distributed with respect to ATV driver age, gender, body size? What type of training did drivers have?
	Driver Information/Other Vehicle	Descriptive	Age, gender, type of vehicle	How are collision incidents distributed with respect to vehicle type and age/gender of the non-ATV driver?
	Equipment Characteristics	Descriptive	Engine size, manufacturer, model, type [utility, sport, youth, tandem, ATC], ATV purchased new/used, purchase source, ATV owner [family, friend, rental, etc.], after market modifications, speed limiter	How are incidents distributed with respect to engine size, manufacturer, and ATV type? Are the ATVs new or used? Rented or privately owned? Have vehicles been modified? Do the ATVs have speed limiters?
	Environment Characteristics	Descriptive	Presence of adult [=> 16], terrain type [paved, unpaved, field, yard, forest, track, etc.], terrain slope, terrain surface, involvement of other vehicles, weather, level of daylight	How are incidents distributed with respect to terrain type? Slope? Surface condition? How are incidents distributed with respect to weather conditions? Level of daylight (day, dusk, night)?
	Event Characteristics	Descriptive	Number of riders on ATV, initiating event/hazard pattern, estimated speed, nonfatal injuries, ATV damage	How are incidents distributed with respect to number of riders on ATV? Hazard pattern?
	Event Analysis	Interpretive	Alcohol and drug usage by driver(s)? For ATV driver: physical limitations? Experience level? Fatigue level? Paying attention to environment? Familiar with incident location? Have permission to ride ATV? Performing a stunt? Who was intended to use ATV? Was visibility a factor? Was control usage a factor?	Did these factors play a role in the incident?
	Prevention Analysis	Interpretive	CPSC's protective measures used or not used	Did the presence/absence of protective measures play a role in the incident?

2. Determine whether there are changes that can be made to the operational/handling characteristics of youth ATVs to reduce injuries and deaths	Equipment Characteristics	Descriptive	Engine size, manufacturer, model	How many incidents involved youth ATVs?
	Event Characteristics	Descriptive	Initiating event, hazard pattern	For incidents involving youth ATVs, was there a common hazard pattern?
	Event Analysis	Interpretive	Did event occur as driver was turning, braking, or shifting? Was speed a factor?	For incidents involving youth ATVs, were incidents associated with a common operation (e.g., braking)? Did speed appear to be a factor?

3. Assess the desirability of illumination on youth ATVs	Equipment Characteristics	Descriptive	ATV equipped with lights; lights turned on or off	How were incidents on adult ATVs distributed with respect to whether the ATV had lights and whether lights were turned on or off?
	Environment Characteristics	Descriptive	Level of daylight	Are events more common during the day? Dusk? Night?
	Event Analysis	Interpretive	Initiating event, hazard pattern, visibility	Did the presence or absence of illumination on adult ATVs matter? Does review of hazard patterns suggest that illumination on youth ATVs may be desirable?

Appendix B: Incident Review Form (Page 1 of 6) — Report Number: ______ — Completed by: (initials)

	Incident Information		Note P	Note Q	Additional Coding Notes
1.a	*date of incident*	[mm/dd/yyyy]			
1.b	*time of day of incident*	[hh:mm]/u			
1.c	*state of incident*	[abbreviation]			
1.d	*city of incident*	[name]			
1.e	*number of deceased persons in incident*	[#]			
1.f	*number of persons with nonfatal injuries*	[#]/u			
1.g	*number of uninjured persons in incident*	[#]/u			
1.h	*number of vehicles involved in incident*	[#]/u			
	Characteristics of Decedent #1 [youngest decedent in incident; Note B]				
2.a.	*age [decedent #1]*	[years]/u			
2.b	*gender [decedent #1]*	male/female/u			
2.c	*weight [pounds] [decedent #1]*	[pounds]/u			
2.d	*height [inches] [decedent #1]*	[inches]/u			
2.e	*ridership status [decedent #1]*	driver/passenger/bystander/other [describe if other]			
2.f	*date of death [decedent #1]*	[mm/dd/yyyy]			
2.g	*cause of death [decedent #1]*	[describe]			
2.h	*alcohol usage [decedent #1]*	yes/no/u			
2.i	*drug usage [decedent #1]*	yes/no/u			
6.a	*helmet worn by decedent #1*	yes/no/u			yes = helmet is worn appropriately (e.g., buckled)
6.b	other safety gear used by decedent #1	[describe]/none/u			none = clothing described/no safety gear (s.g.) noted yes = s.g. noted; u = clothing/s.g not described
2.j	additional comments [decedent #1]	[comment]			
	Characteristics of Decedent #2 [oldest decedent in incident; Note B]				
3.a	*age [decedent #2]*	[years]/u/na			
3.b	*gender [decedent #2]*	male/female/u/na			
3.c	*weight [pounds] [decedent #2]*	[pounds]/u/na			
3.d	*height [inches] [decedent #2]*	[inches]/u/na			
3.e	*ridership status [decedent #2]*	driver/passenger/bystander/other/na [describe if other]			
3.f	*date of death [decedent #2]*	[mm/dd/yyyy]/na			
3.g	*cause of death [decedent #2]*	[describe]/na			
3.h	*alcohol usage [decedent #2]*	yes/no/u/na			
3.i	*drug usage [decedent #2]*	yes/no/u/na			
6.a.i	*helmet worn by decedent #2 [if on atv]*	yes/no/u/na			yes = helmet is worn appropriately (e.g., buckled)
6.b.i	other safety gear used by decedent #2 [if on atv]	[describe]/none/u/na			none = clothing described/no safety gear (s.g.) noted yes = s.g. noted; u = clothing/s.g not described
3.j	additional comments [decedent #2]	[comment]			

PLEASE SEE PAGE 6 FOR NOTES AND CODING CONVENTIONS

FACTORS IN ITALICS WERE PRE-FILLED FROM INFORMATION IN THE ATV FATALITIES DATABASE (ATVD). THIS INFORMATION MAY BE CHANGED OR AMENDED BY EACH REVIEWER (NOTE E).

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			Note P	Note Q	Additional Coding Notes
	Characteristics of Driver #1 **[youngest atv driver; Note C]**				
4.a	*age [driver #1]*	[years]/u			
4.b	*gender [driver #1]*	male/female/u			
4.c	*weight [pounds] [driver #1]*	[pounds]/u			
4.d	*height [inches] [driver #1]*	[inches]/u			
4.d.i	other information regarding size of driver #1	[describe]/not_available [Note I]			
4.e	formal training [driver #1]	yes/no/u [describe if yes]			
4.e.i	informal training [driver #1]	yes/no/u [describe if yes]			
4.k	additional comments [driver #1]	[comment]			
	Characteristics of Driver #2 **[oldest atv driver or non-atv driver; Note C]**				
5.a	*age [driver #2]*	[years]/u/na			
5.b	*gender [driver #2]*	male/female/u/na			
5.c	*weight [pounds] [driver #2/atv drivers only]*	[pounds]/u/na			
5.d	*height [inches] [driver #2/atv drivers only]*	[inches]/u/na			
5.d.i	other information regarding size of atv driver #2	[describe]/not_available /na [Note I]			
5.e	formal training [driver #2/atv drivers only]	yes/no/u/na [describe if yes]			
5.e.i	informal training [driver #2/atv drivers only]	yes/no/u/na [describe if yes]			
5.k	*type of vehicle [driver #2]*	atv/car/truck/motorcycle/other/na [describe if other]			
5.l	additional comments [driver #2]	[comment]			
	Characteristics of ATV #1 **[Note D]**				
6.c	*atv #1 engine size*	[cc's]/u	CRC, EC, ME		
6.d	*atv #1 manufacturer*	[name]/u			
6.e	*atv #1 model*	[name]/u			
6.f	*atv #1 year*	[yyyy]/u			
6.g	atv #1 type [utility or sport]	utility/sport/u	CRC, EC, ME		
6.g.i	atv #1 intended for youth use by manufacturer	yes/no/u	CRC, EC, ME		
6.h	tandem atv [yes or no/atv #1]	yes/no/u	CRC, EC, ME		
6.i	atv #1 purchased new or used by current owner	new/used/u			
6.i.i	atv #1 purchase source	dealer/Internet/friend/other/u			
6.i.iii	atv #1 ownership	parent/other_relative/friend/driver/other/u			
6.j	atv rental [yes or no/atv #1]	yes/no/u			
6.l	atv #1 equipped with lights	yes/no/u	CRC, EC, ME		
6.l.i	after-market mods, incl added lights [atv #1]	yes/no/u [describe if yes]			
6.l.ii	if present, lights turned on [atv #1]	yes/no/u			
6.m	atv #1 speed limiter on	yes/no/u			default = "no" for adult atvs
6.n	additional comments [atv #1]	[comment]			

	Characteristics of ATV #2 [Note D]		Note P	Note Q	Additional Coding Notes
6.c	*atv #2 engine size*	[cc's]/u/na	CRC, EC, ME		
6.d	*atv #2 manufacturer*	[name]/u/na			
6.e	*atv #2 model*	[name]/u/na			
6.f	*atv #2 year*	[yyyy]/u/na			
6.g	atv #2 type [utility or sport]	utility/sport/u/na	CRC, EC, ME		
6.g.i	atv #2 intended for youth use by manufacturer	yes/no/u/na	CRC, EC, ME		
6.h	tandem atv [yes or no/atv #2]	yes/no/u/na	CRC, EC, ME		
6.i	atv #2 purchased new or used by current owner	new/used/u/na			
6.i.ii	atv #2 purchase source	dealer/Internet/friend/other/u/na			
6.i.iv	atv #2 ownership	parent/other_relative/friend/driver/other/u/na			
6.j	atv rental [yes or no/atv #2]	yes/no/u/na			
6.l	atv #2 equipped with lights	yes/no/u/na	CRC, EC, ME		
6.l.i	after-market mods, incl added lights [atv#2]	yes/no/u/na [describe if yes]			
6.l.ii	if present, lights turned on [atv #2]	yes/no/u/na			
6.m	atv #2 speed limiter on	yes/no/u/na			default = "no" for adult atvs
6.n	additional comments [atv #2]	[comment]			
	Characteristics of Environment				
7.b	adult present [≥ 16 years old]	question deleted [too ambiguous to assess consistently]			adult defined as individual 16 years old or older
7.d	terrain being traveled prior to incident **[may select more than 1]**				change from previous versions/select all that apply
7.d.i	paved road [including public and private roads]	yes/no/u			
7.d.ii	unpaved road [including public and private roads]	yes/no/u			
7.d.iii	field, pasture, farmland, ranchland	yes/no/u			
7.d.iv	yard/lawn	yes/no/u			
7.d.v	forest/woods	yes/no/u			
7.d.vi	off-highway vehicle park/atv track	yes/no/u			
7.d.vii	other	yes/no/u [describe if yes]			
7.d.viii	unknown	yes/no			
7.e	terrain type	embnkmt/ditch/hill/dune/flat/other [describe if other]			reworded category/version 3.1
7.e.i	direction of travel on slope	up/down/across/crest/na/u			applicable only for hills, dunes
7.f	terrain surface	pavement/gravel/mud/ice/snow/grass/dirt/other/u			
7.f.i	surface condition of terrain	dry/wet/other/u [describe if other]			
7.g	were other vehicles involved in incident	yes/no/u [describe vehicle type(s) if yes]			
7.h	weather	clear/cloudy/raining/snowing/sleeting/u			
7.i	degree of daylight [dawn, day, dusk, night]	dawn/day/dusk/night/u			
7.k	additional comments	[comment]			

Appendix B: Incident Review Form (Page 4 of 6) **Report Number: ______** **Completed by: (initials)**

	Characteristics of Event		Note P	Note Q	Additional Coding Notes
8.a	*total number of riders/atv #1 [including driver]*	[#]/u			
	age of passenger(s)/atv #1	#/#/u			new category, version 3.1
8.b	*total number of riders/atv #2 [including driver]*	[#]/u/na			
	age of passenger(s)/atv #2	#/#/u/na			new category, version 3.1
8.c	*initiating event [select only 1]*	ovt/collsn/ejctd/grade/handlebar/u			
8.d	hazard pattern [select all that apply]	---			
8.e	atv overturned [ovt]	yes/no/u			
8.e.i	- flipped forward	yes/no/u			
8.e.ii	- flipped backward	yes/no/u			
8.e.iii	- rolled sideways	yes/no/u			
8.e.iv	- overturned in unknown direction	yes/no/u			
8.e.v	pinned	yes/no/u [Note M]			
8.g	collision [collsn]	yes/no/u			
8.f	- atv hit stationary object [incl parked vehicle]	yes/no/u			may also include terrain features such as embnkmts
8.g.i	- atv hit moving vehicle [incl head-on collision]	yes/no/u			
8.g.ii	- other moving vehicle hit atv	yes/no/u			
8.g.iii	- other or unknown	yes/no/other/u [describe if other]			
8.h	ejected: thrown, fell, or jumped off [ejctd]	yes/no/u			
8.i	sudden change in grade [grade]	yes/no/u [describe if yes]			
8.j	contact with handlebar [handlebar]	yes/no/u			yes = handlebar contact explicitly reported no = "no handlebar contact" is explicitly reported u = nothing is said in reports about handlebar(s)
8.k	unknown hazard pattern [u]	yes/no			
8.l	*hazard summary*	[describe]			
8.m.i	estimated atv speed [miles per hour (mph)]	#1:[mph]/u; #2:[mph]/u/na			
8.n	did event occur as driver was purposely turning	#1:yes/no/u; #2:yes/no/u/na [Note N]			
8.n.i	if so, left or right	#1:left/right/u/na; #2:left/right/u/na			
8.s	nonfatal injuries	yes/no/na/u [describe if yes]			
8.s.i	ridership status of injured individuals	driver/passenger/bystander/other [describe if other]			
8.t	did atv(s) sustain any damage in incident	#1:yes/no/u; #2:yes/no/u/na [Note O]			
8.u	additional comments	[comment]			

 Report Number: ______ **Completed by: (initials)**

	Event/Prevention Analysis		Note P	Note Q	Additional Coding Notes
4.i	alcohol usage [driver #1]	yes/suspected/not_suspected/no/u	HF, HS		
4.j	drug usage [driver #1]	yes/suspected/not_suspected/no/u	HF, HS		
4.d.ii	physical limitations [driver #1]	yes/no/u [describe if yes] [Note J]	HF, HS		
4.f	experience level [driver #1]	[describe]/u	HF		
4.g	fatigue level [driver #1]	[describe]/u	HF		
4.h	was driver #1 paying attention to environment	likely/unlikely/u	HF		
4.h.i	was driver #1 familiar with incident location	likely/unlikely/u [Note K]	HF		
6.k	who did atv owner intend to use atv #1	adults_only/youth_only/both/u [Note L]			default = unknown
5.i	alcohol usage [driver #2; any type vehicle]	yes/suspected/not_suspected/no/u/na	HF, HS		
5.j	drug usage [driver #2; any type vehicle]	yes/suspected/not_suspected/no/u/na	HF, HS		
5.d.ii	physical limitations [driver #2; atv drivers only]	yes/no/u/na [describe if yes] [Note J]	HF, HS		
5.f	experience level [driver #2; atv drivers only]	[describe]/u/na	HF		
5.g	fatigue level [driver #2; atv drivers only]	[describe]/u/na	HF		
5.h	was atv driver #2 paying attention to environment	likely/unlikely/u/na	HF		
5.h.i	was atv driver #2 familiar with incident location	likely/unlikely/u/na [Note K]	HF		
6.k.i	who did atv owner intend to use atv #2	adults_only/youth_only/both/u/na [Note L]			default = unknown or not applicable (na)
7.a	was there direct supervision by adult [≥ 16 years old]	likely/unlikely/u	HF		adult defined as individual 16 years old or older
7.c	permission to operate atv(s) at time of incident	likely/unlikely/u	HF		
7.j	was visibility a factor	likely/unlikely/u	HF, ME	Future	
8.m	was speed a factor	likely/unlikely/u	HF, ME		
8.o	did event occur as atv driver(s) was(were) braking	likely/unlikely/u	ME	Future	likely = action explicitly reported
8.p	did event occur as atv driver(s) was(were) shifting	likely/unlikely/u	ME	Future	likely = action explicitly reported
8.q	did event occur as atv driver(s) performing stunt	likely/unlikely/u [describe stunt if likely]	HF, ME		
8.r	control usage by atv driver	---	HF, ME		
8.r.i	control confusion	#1:likely/unlikely/u; #2:likely/unlikely/u/na	HF, ME		
8.r.ii	excess control input by atv driver	#1:likely/unlikely/u; #2:likely/unlikely/u/na	HF, ME		
8.r.iii	inadequate control input by atv driver	#1:likely/unlikely/u; #2:likely/unlikely/u/na	HF, ME		
9.a	would helmet have prevented fatality	maybe/no/u	HS	Future	"maybe" only where cause of death = head inj
9.b	would transitional vehicle have prevented fatality	question deleted [insufficient information to assess]		Future	category deleted in version 3.0
9.c	atv driver(s) doing "everything right"	#1:yes/no/u; #2:yes/no/u/na		Future	
9.d	were 1 or more protective measures not used	yes/maybe/no/u [list no. from Note H if yes/maybe]		Future	
9.e	what action(s) may have prevented fatality	[describe]/u		Future	exclude helmet use in this tabulation
9.f	additional comments	[comment]			

Appendix B: Incident Review Form (Page 6 of 6) **Report Number:** ______ **Completed by: (initials)**

Notes and Coding Conventions:

A. na = not applicable; u = unknown; incl = including; mods = modifications; embnkmt = embankment

B. Decedent #1 - youngest decedent Decedent #2 - oldest decedent

C. Driver #1 - youngest atv driver Driver #2 - oldest atv driver or non-atv driver

D. ATV #1 - operated by youngest driver ATV #2 - operated by oldest driver

E. Factors in italics are pre-filled from atvd database; values may be changed by reviewer

F. Select response from choices; brackets provide direction or indicate type of information needed

G. Transitional vehicle = intermediate-sized atv (between youth and adult models); definition based on size (in accordance with current CPSC guidelines) rather than speed (SVIA recommendation)

H. Protective measures: (1) get trained; (2) wear a helmet; (3) no youths on adult atvs; (4) don't ride tandem; (5) don't ride on pavement; (6) don't ride under the influence

I. Other information regarding size: e.g., small for age, large for age, etc.

J. Physical limitations: e.g., too short to reach controls

K. Familiarity with incident location: code yes if incident occurred in driver's yard or in friend's/neighbor's yard

L. Question 6.k addresses current owner; purchase may not have been exclusively for use by youth (e.g., atv may be for use by several family members, including youths)

M. "Pinned" is not considered an initiating event (following Petition/Tab F analysis); pinning may occur without overturning

N. Purposely turning includes going around a curve

O. ATV damage: state yes if even minimal damage

P. All team members can code all questions. Notes in this column simply identify CPSC staff who may have particular expertise or interest in a given area. [CRC: CPSC Compliance staff; EC: CPSC Economics staff; HF: CPSC Human Factors Engineering staff; HS: CPSC Health Sciences staff; ME: CPSC Mechanical Engineering staff]

Q. Future analysis: coding of these factors is optional; extra resources will be required to fully assess these factors and conduct these analyses.

Appendix C: Hazard Summaries

Incident No.	Scope Code	Hazard Summary
1	i	3 teenagers on atv; drove over terrace; atv overturned; victim ejected
2	i	atv hit parked car; victim ejected
3	i	victim on 4-year-old friend's atv w/ 4-year-old as passenger; atv overturned; victim ejected
4	i	atv making u turn; victim ejected from atv; victim trapped underneath atv
5	i	front atv slowed down and was hit by a 2nd atv from behind; rear atv overturned; victim ejected
6	i	atv collision with snow mobile; victim ejected
7	i	atv overturned, pinning driver; victim found under atv
8	i	atv hit tractor trailer cab while crossing paved road
9	i	collision with 2nd atv; unknown if 2nd atv was moving
10	i	atv operator was "spinning donuts;" atv overturned; victim pinned
11	i	atv went over embankment; atv airborne; victim ejected
12	i	atv operator (victim) attempted to go under a wire used as a dog run; wire caught operator's neck; operator ejected
13	i	atv was broadsided by a sandrail; atv operator was ejected
14	i	atv operator was ejected and pinned with atv on her back
15	y	atv jumped railroad tracks at crest of hill; atv became airborne; atv hit car; victim was ejected and thrown over car
16	i	victim pinned under overturned atv
17	u	vehicle drifted off road into ditch; victim ejected; vehicle traveled up embankment, overturned onto left side; victim pinned
18	i	atv driver passed another atv at high speed and overturned; victim ejected and hit head on stump
19	i	victim hit neck on cable stretched across trail; victim ejected
20	i	atv overturned; victim pinned
21	h	accidental throttle depression by toddler; atv hit concrete wall; victim ejected into wall
22	i	atv went down embankment and up the other side; atv became airborne; victim ejected; atv overturned
23	i	atv encountered rut while going through curve; atv overturned, victim jumped off, atv rolled over victim
24	i	atv went off road into ditch and hit tree; atv overturned; victim ejected into tree
25	i	atv hit tree and overturned; victim pinned
26	i	atv ran stop sign and was hit by pickup truck; both victims were ejected
27	t	atv missed curve; atv hit fence post; atv hit tree; atv overturned; victim ejected
28	i	atv missed curve and hit fallen tree limb; victim ejected; atv overturned and hit tree; victim hit by overturning atv
29	u	vehicle going up hill/embankment and overturned; victim ejected/pinned by atv
30	i	atv going downhill; atv encountered dip and overturned; victim ejected
31	i	atv entered a drainage ditch; atv hit cement culvert and overturned; victim ejected
32	i	atv going uphill; atv was turning right and overturned; victim ejected/pinned by atv
33	i	atv missed curve; atv hit tree; victim ejected
34	i	atv overturned; victim pinned
35	i	atv encountered dip/drainage ditch in trail; atv airborne; victim ejected; atv overturned
36	i	atv drifted off left side of road; atv hit tree
37	i	atv left roadway and hit barbed wire fence; passenger and driver ejected
38	i	van trying to pass atv; atv hit by van from rear as atv was turning left into drive in front of van; atv driver ejected and trapped under van
39	i	atv hit parked car; atv flipped over, atv driver and passenger ejected
40	i	atv hit child playing in yard near road; unknown whether victim entered roadway or atv entered yard
41	i	atv traveled over dirt mound; atv overturned; victim ejected; atv rolled over victim
42	u	vehicle failed to negotiate turn; atv overturned onto its side; driver and 2 passengers ejected; driver and 1 passenger pinned
43	i	atv encountered deep rut; atv traveled off road over edge of ravine; atv airborne; driver and passenger ejected
44	i	atv ran off drive into small ditch; overturned; driver and passenger ejected; both pinned by atv
45	h	passenger jumped off atv to retrieve hat
46	i	atv overturned; victim ejected/pinned by atv
47	i	wheelied 20 feet into tree; victim ejected and hit head on tree
48	i	atv overturned; victim ejected
49	i	atv attempted to pass oncoming truck by moving to right of roadway; bounced off brush, rocks; atv caught in deep ditch; victim ejected and hit by truck
50	i	handlebar caught on chain link fence; victim ejected under fence
51	i	atv veered down into ditch, struck opposite bank; driver and passenger ejected
52	i	atv pulled out onto paved road from dirt road; car hit left side of atv; atv driver and passenger ejected
53	i	ran off shoulder of road after going around a curve; atv ran down an embankment, ejecting driver and passenger; atv overturned
54	i	atv traveling in ditch; hit unknown object (or encountered embankment) and became airborne; driver/passenger ejected; atv overturned; atv landed on passenger and bounced off
55	h	victim found in river, 5.9 miles downriver from family's farm
56	i	victim attempted to make sharp right turn; atv overturned; victim ejected, pinned
57	i	applied brakes in turn; left roadway; atv hit stump, then tree; atv overturned; victim ejected
58	i	atv veered off left side of roadway; atv went down embankment and overturned; victim ejected and hit trees
59	i	atv skidded into curb; atv overturned; victim ejected
60	i	atv traveling along dirt trail; entered roadway from right; hit by mini van; victim ejected
61	i	atv ran red light; atv hit oncoming car; passenger and driver ejected
62	i	atv failed to turn, slid, rolled down hill, and overturned; driver and passenger ejected; passenger pinned between atv and tree
63	i	dirt bike and atv collided almost head-on; dirt bike driver, dirt bike passenger and atv passenger ejected
64	i	atv encountered small embankment or small dip; atv overturned; driver and passenger ejected; atv rolled over driver
65	i	atv flipped forward according to news account; no other details available

Appendix C: Hazard Summaries

Incident No.	Scope Code	Hazard Summary
66	i	atv in high gear; atv overturned; atv rolled over victim
67	i	atv crossed paved, public road; atv struck by p/u truck pulling horse trailer (w/2 horses); victims ejected
68	i	atv went over terrace; hit ground; bounced; atv overturned; victim ejected; atv rolled over victim
69	i	atv encountered dip obscured by tall grass; driver and passenger ejected
70	i	collision with pickup truck; atv passenger ejected
71	i	atv struck hole, overturned, atv hit victim in chest
72	h	3 year old male allowed to "drive" atv; hit gas hard and turned handlebars to left simultaneously; driver and passenger ejected; atv overturned
73	i	unknown
74	t	3 wheel atv without lights was hit from behind while turning into drive; victim ejected
75	i	atv traveling west in east bound lane of paved road; atv collided with dump truck heading east; victim ejected
76	i	atv attempted to travel up steep embankment to get around fallen tree; victim ejected as atv overturned; victim hit head on rocks, then pinned by atv
77	i	atv drove over 20 foot cliff in sand pit; victim ejected/pinned
78	i	atv drove over 100 ft sand hill, with 25 ft drop on other side [slip face]; victim ejected/pinned
79	t	atv crossed paved road; atv broadsided by van; victim ejected
80	i	driver negotiating s curve; failed to complete 2nd turn; atv started sliding; atv went into shoulder/ditch and overturned; victim ejected/pinned
81	i	atv traveled from dirt portion of drive to concrete portion of drive; atv overturned; victim ejected/pinned
82	i	atv ran off road up an embankment; atv returned to road, ran up embankment again; atv overturned; driver and passenger ejected
83	i	atv went off road to left into brush; atv overturned; driver and victim ejected/pinned
84	i	atv hit by car while crossing paved roadway
85	i	atv exited drive way and encountered dip; atv overturned; victim ejected
86	i	atv #1 hit rear of atv #2 in race event; atv#1 driver (decedent) ejected; atv #1 overturned and pinned atv driver #1
87	i	atv drove off a private driveway onto public road into path of pickup truck; atv driver pinned between atv and truck; atv passenger ejected
88	i	atv entered public, paved road way from private dirt path and was struck by car
89	h	atv struck tree, causing tree to fall on victim
90	i	atv overturned on road; victim ejected; atv rolled over victim
91	i	atv traveled up hill; atv became airborne; driver attempted sharp right turn; atv slid and overturned; victim pinned
92	i	victim jumped small dune and stopped on blind side; friend on 2nd atv jumped dune behind her; 2 atv's collided (2nd atv landed on top of victim and her atv); victim ejected; 2nd atv went end over end and landed on 2nd driver
93	i	victim died at hospital after apparently running off road and colliding with fence
94	y	atv attempted to climb steep dirt mound; atv overturned; victim ejected
95	i	atv pulling parent behind on tube on snow covered ground; atv encountered dip; atv overturned; atv driver ejected
96	h	atv exited farm lane onto frozen pond; atv fell through ice
97	h	decedent was riding on atv's rear rack and jumped off
98	i	atv entered roadway from south ditch adjacent to roadway; atv collided with car; victims ejected
99	i	atv traveling in ditch along north edge of roadway; atv turned toward road and overturned; driver and passenger ejected
100	u	vehicle appeared to be making u turn in wheat field and overturned; victim pinned
101	i	atv traveled on road with icy pavement; atv failed to negotiate curve and slid off road over 100 foot embankment; victims ejected
102	u	vehicle overturned; victim pinned
103	u	vehicle driver was "messing with the steering wheel;" vehicle ran off right side of road into ditch and overturned

Scope codes:

i = in-scope incident

h = out-of-scope incident due to hazard pattern

t = out-of-scope incident due to vehicle type (3-wheel all terrain cycle)

u = out-of-scope incident due to vehicle type (utility vehicle)

y = out-of-scope incident due to year of death (year of death was not 2005)

B

UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
WASHINGTON, DC 20207

Memorandum

Date: February 13, 2008

TO : Elizabeth Leland, Project Manager, ATV Team

THROUGH: Hugh M. McLaurin, Associate Executive Director, MK for HMM
Directorate for Engineering Sciences
Mark Kumagai, Director, Division of Mechanical Engineering MK

FROM : Caroleene Paul and Mike Karen, Division of Mechanical Engineering C.P. MK

SUBJECT : Status of All-Terrain Vehicles (ATVs) Testing at Aberdeen Test Center (ATC)

Background and Introduction

In August 2006, the U. S. Consumer Product Safety Commission (CPSC) issued a Notice of Proposed Rulemaking (NPR) that proposed to ban three-wheeled ATVs and mandate performance, informational, and offer-of-training requirements for youth and adult four-wheeled all-terrain vehicles (ATVs).[1] Included in the NPR (section P) was instruction from the Commission to the CPSC staff to take several actions regarding ATVs. Of the eight actions focused on youth model ATVs, two specifically instructed CPSC staff to perform vehicle testing to answer the following:

1. Test current youth models against one another to determine if there are characteristics of some models that make them more stable or otherwise less incident prone than other models.

2. Determine whether making the junior and /or pre-teen youth models less rider interactive (lateral stability, braking systems, etc.) could reduce or eliminate deaths or injuries on youth models.

In order to meet the Commission direction to perform comparative testing of youth ATVs, CPSC staff contracted with the U.S. Army Aberdeen Test Center (ATC) Automotive Instrumentation Division to perform an in depth test and evaluation program on nine different youth model ATVs. ATC is the lead test center for automotive testing for the Department of Defense, and their capabilities include instrumentation expertise, dedicated test locations for various automotive tests, and vast experience testing a variety of motorized vehicles. Partnering with ATC was undertaken to obtain the technical expertise of the vehicle dynamics staff and the test area resources of the facility itself (for example, level concrete areas for brake tests).

CPSC staff visited three major manufacturers of ATVs and met with their design engineers to develop a better understanding of the technical issues associated with testing ATVs. The

[1] Consumer Product Safety Commission, "Standard for All Terrain Vehicles and Ban of Three-Wheeled All Terrain Vehicles: Notice of Proposed Rulemaking", Federal Register, Volume 71, No. 154, August 10, 2006, pp 45904 – 45962.

purpose of the visits was to learn about the manufacturers' research, development, test and evaluation, and engineering facilities. In particular, staff was interested in the test methods used to determine compliance with the voluntary standard, ANSI/SVIA 1 *American National Standard for Four Wheel All-Terrain Vehicles*, as well as test methods that are used to evaluate vehicle stability and performance. Lastly, CPSC staff was interested in learning about newly emerging off-road vehicles, predominantly side-by-side, off-road vehicles because these vehicles may present a more stable alternative to ATVs.

CPSC staff also visited the National Highway Traffic Safety Administration's (NHTSA) Vehicle Research and Test Center (VRTC) and met with VRTC/NHTSA engineers working on vehicle stability. The purpose of the VRTC/NHTSA visit was to discuss NHTSA's experience with rollover research, test and evaluation methods, and technical solutions such as the Electronic Stability Control (ESC) system, and to determine if similar test and evaluation methods could be applied to ATVs.

This memorandum summarizes the test method being used and the progress that has been made in the test and evaluation program of nine youth model ATVs at the ATC facility in Aberdeen, MD. This memorandum also summarizes the visit to VRTC/NHTSA. Reports from the visits to the ATV manufacturing plants are restricted and will be provided to the Commission separately.

Test and Evaluation of ATVs at Aberdeen Test Center

Test Requirements

The voluntary standard for ATVs is ANSI/SVIA 1 *American National Standard for Four Wheel All-Terrain Vehicles*. The standard was published in 1990 and was revised in 2001 and 2007. The standard predominantly addresses design and configuration aspects of ATVs such as throttle, clutch, and gearshift control operation and location. The primary safety and stability related requirements are for service brake operation performance, maximum vehicle velocity limits (for youth model ATVs), parking brake performance, and pitch stability.

The vehicle configuration and performance requirements in the voluntary standard's 2001 revision were essentially identical to the original 1990 standard. Recently, more significant changes were made in the 2007 revision which include new requirements for labeling, adult two-person tandem ATVs, T category youth ATVs, and modified requirements for youth category ATVs and brake test methodology.[2] The performance requirements in the 2007 revision are effective for ATV models that were produced after July 23, 2007 (the date the standard was approved). Since the nine vehicles in the test and evaluation program were all manufactured before the publication date of the 2007 standard, the vehicles are being evaluated to the brake and speed requirements in the 2001 standard, ANSI/SVIA 1-2001.

Aside from the brake, speed, and static pitch stability requirements in the voluntary standard there are no existing standard test procedures to evaluate the dynamic performance or stability of

[2] Category T (Transition Model) ATVs are not on the market yet but are defined in the 2007 standard as "an ATV of appropriate size that is intended for recreational use by an operator age 14 or older under adult supervision, or by an operator age 16 or older." Based on comments by industry and user groups regarding the incompatibility of larger children on smaller youth size ATVs, the Category T ATV appears to be an attempt to match larger ATVs to larger children. In addition to size, the Category T ATVs will also have a higher maximum speed of 38 mph instead of the 30 mph limit for youth ATVs in the 2001 standard.

ATVs. It has historically been difficult to define performance requirements for ATVs due to the complicated nature of off-road vehicle dynamics, substantial differences of opinion over difficult technical issues such as the correlation between static stability and dynamic stability, and the absence of direct correlations between accident data and specific vehicle characteristics. The automotive industry has accepted and standardized test and evaluation methods to characterize vehicle dynamics that are currently used to measure safety and performance. Engineering Sciences (ES) staff recognizes that ATVs have unique characteristics such as rider active weight distribution, solid rear axle, low pressure tires, and a relatively high center of gravity that differentiate them from automobiles. However, ES staff believes that applying some of the basic automotive tests and parameters to ATVs provides a reasonable baseline from which to compare and analyze the technical issues related to ATVs. This approach was used by CPSC staff in 1985 and resulted in the development of the first voluntary standard for ATVs in 1990.

ES staff contracted with the Automotive Instrumentation Division of ATC because of their extensive experience with automotive testing and evaluation. ATC staff have technical expertise in designing and developing customized instrumentation, performing standard static and dynamic vehicle tests, processing raw data, and analyzing/interpreting the processed data in many types of vehicles.

Vehicle Metrics

In order to establish a baseline against which youth model ATVs may be compared, a number of vehicle characteristics or "metrics" must first be measured. The vehicle metrics being measured on the 9 youth ATVs at ATC are:

- track width
- wheel base
- vehicle weight
- center of gravity location
- static stability factor (SSF)
- lateral tilt angle
- pitch tilt angle
- parking brake performance
- yaw moment of inertia
- roll moment of inertia
- pitch moment of inertia
- maximum vehicle speed
- brake test speed
- brake deceleration/stopping distance
- maximum lateral acceleration
- steering characteristics

An explanation of the vehicle metrics which may be categorized as either static (stationary measurements) or dynamic (measurements taken on moving ATV's) follows.

Static Metrics:

The static metrics are vehicle track width (width of vehicle from left tire centerline to right tire centerline), wheelbase (length of vehicle from front axle to rear axle), center of gravity location, and vehicle weight. Another metric based on the geometric properties of the vehicle is the static stability factor (SSF) which is a standard automotive metric that is defined as one half the track width divided by the center of gravity height. Geometrically, the SSF is also equal to the tangent of the angle at which the vehicle laterally tips over, a measurement that can be made by putting the vehicle on a table and tilting the table until the vehicle tips.

Another important vehicle metric is its moment of inertia. Movement of an object can either be linear or rotational. In linear motion, an object's mass is an indicator of its resistance to movement, or its inertia. In rotational motion, an object's moment of inertia is an indicator of its resistance to rotate about a given axis. The moment of inertia is used in calculations for torque, momentum, work, energy, and power, and is useful when comparing one vehicle to another in terms of the vehicle's resistance to roll (rotation around the longitudinal axis), pitch (rotation around the lateral axis), and yaw (rotation around the vertical axis).

Many of the static metrics are useful when analyzing how a vehicle performs dynamically. For instance, a vehicle that stands out in dynamic tests for a certain characteristic may have an obvious static metric that explains the outlier behavior. Such analyses are useful in understanding what factors may have the most effect on vehicle performance.

Dynamic Metrics:

Maximum vehicle speed is a standard dynamic vehicle measurement. ANSI/SVIA 1-2001 requires that a youth ATV intended for children ages 6 and over have a maximum unrestricted speed of 15 mph. The maximum unrestricted speed for youth ATVs intended for children age 12 and over is 30 mph. (As previously noted, these parameters are changed in the 2007 revision of ANSI/SVIA 1)

A vehicle's maximum unrestricted speed is used to calculate its brake test speed (speed at which brake tests are performed). ANSI/SVIA 1-2001 specifies calculation of the brake test speed and the brake test performance requirements in accordance with the Federal Motor Vehicle Safety Standards and Regulations (FMVSS) for motorcycle brake systems (the FMVSS requirements were adapted for ATVs). ANSI/SVIA 1-2001 requires that an ATV with a maximum speed greater than 18 mph must be able to brake/decelerate at 0.6g or higher when tested at the brake test speed.

A common automotive test that is not included in ANSI/SVIA 1-2001 is the skid pad, or steady state turn circle, test. This test provides valuable information on tire characteristics and vehicle handling and has been used by CPSC staff in the past to evaluate ATV performance. To perform a turn circle test, the ATV is driven around a circle of known diameter at increasing speeds until the test driver cannot keep the vehicle in the turn or the vehicle lifts up onto two tires (laterally tips over). This limit condition provides the maximum dynamic lateral acceleration of the vehicle in a turn. Handle bar steer angle, roll angle, and accelerometer data are the primary outputs recorded for this test. A 100 foot diameter turn circle is used for the ATV tests and two wheel lift off is the limit for all tests. The maximum lateral acceleration recorded during a turn circle test can be compared vehicle to vehicle, and it can be compared to the vehicle's static limit equivalent, namely the lateral tilt table angle and the Static Stability Factor (SSF).

The steer angle measurements in the turn circle tests also indicate whether the vehicle is exhibiting understeer (vehicle turns less than input at handlebar), neutral steer (vehicle turns at same rate as input at handlebar), or oversteer (vehicle turns more than input at handlebar). Understeer is generally preferred in automobiles because it provides a safer margin of error. If the car understeers, and no correction is made the result is a wider corner than intended, but the car remains stable. If the car oversteers, and no correction is made the result is a sharper turn than intended and the situation becomes worse until the rear wheels lose grip, the car spins, and directional control is lost. Oversteer vehicles are difficult to control and are limited to racing vehicles. In 1985, CPSC staff discovered that ATVs exhibited understeer at lower speeds and oversteer at higher speeds. It is unusual for a vehicle to both understeer and oversteer and this concerned staff because an unpredictable steering response places a higher burden on the operator to adjust his/her steering input to maintain vehicle direction.

Test Methodology

Vehicle dimensions (wheel base and track width) are measured using a standard tape measure and plumb. Vehicle weight is measured using four independent wheel scales (see Figure 1). This method also allows for computation of the longitudinal and lateral locations of the center of gravity based on the front/rear and right/left vehicle weight distribution. The vertical location of the center of gravity is then measured by lifting each end of the vehicle more than 45 degrees and using basic physics principles to calculate the location. This method is routinely used by ATC to determine the center of gravity location for a variety of test vehicles. The static stability factor is calculated directly from the track width and vertical center of gravity height measurements.

Figure 1. ATV Weight Measurement on Wheel Scales

The ATC staff fabricated a steel table that can be lifted by overhead crane to measure the lateral and pitch, or longitudinal, tilt angles of the ATVs (see Figure 2). The ATV is placed on the table with the front wheels pointing straight. The table is lifted until the two uphill side wheels lift up from the table and the angle is measured with a digital inclinometer. This method is used in both lateral and pitch directions.

The static tilt angle of an ATV is a function of the geometric dimensions of the vehicle and its center of gravity. The addition of a rider raises the system's center of gravity which essentially makes the system less stable. A rider can lean his/her weight to shift the system center of gravity to increase (or decrease) lateral or pitch stability -- this is known as rider interaction.
To quantify the effects of rider interaction, the lateral tilt table tests are performed with a 134 lb weight that is located at the system's center of gravity (as calculated with a 134 lb test rider).[3] The tilt table tests are repeated with the 134 lb weight shifted to increase lateral stability (offset to uphill side to prevent tip over). The offset distances are based on wheel scale measurements made with the 134 lb test rider actively leaning to one side or another. A plot of the vehicle's tilt angle versus test weight location will provide a profile of the effects of weight shift on static lateral stability. This effort to profile weight shift effects is an exploratory method developed by ATC staff. It has not been performed by CPSC staff in the past, nor to the knowledge of ES staff has it been performed by the ATV industry.

Figure 2. Tilt Table

[3] The 134 lb weight represents the mean weight for males and females ages 15.5 to 16.5 years. An 88 lb weight representing the mean weight for males and females ages 11.5 to 12.5 years is used on ATVs labeled for children age 6 and over.

The ATC staff also fabricated a steel frame with a freely swinging table to measure moment of inertia (MOI) (see Figure 3). The ATV is placed on the table and the table is carefully rotated so that it freely swings in one plane. Its period of oscillation is measured by a yaw sensor that is directly on the table and by an optical sensor mounted on the MOI table frame. Statistical analysis of both period measurements provides the most accurate value. The moment of inertia of the ATV is then calculated from the period of oscillation.

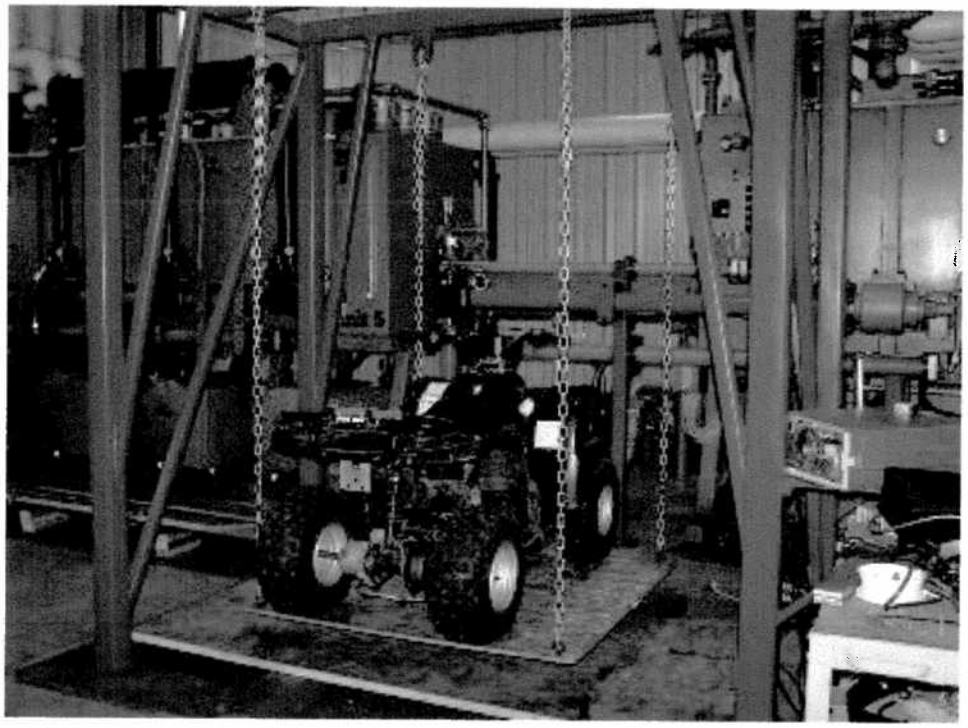


Figure 3. Moment of Inertia Table/Frame

The ATC staff developed a portable and interchangeable instrumentation package that is mounted on board the test ATVs to measure vehicle speed, vehicle acceleration in three axes, force input by the driver to the brake levers and pedals during braking, brake stopping distance, and handlebar steer angle (see Figure 4). An Inertial Measurement Unit (IMU) from Pi Research, Inc. measures acceleration in three axes. Speed and distance measurements are made using a fifth wheel that was fabricated with an optical sensor in the hub (see Figure 4). The fifth wheel is dragged behind the ATV and maintains constant rolling contact with the ground. The optical hub measures 600 pulses per revolution and is calibrated to the circumference of the wheel. This method provides accurate real time measurement of distance, velocity, and acceleration. Speed and distance measurements are also made with a Global Position Satellite (GPS) based system from Racelogic, Ltd. called the Velocity Box (VBOX). The system used by ATC is the VBOX 20Hz Speed Sensor with Slip Angle, VBS20SL. The system consists of two GPS receivers and the Speed Sensor box. The Racelogic system provides accurate real time measurements of distance, velocity, slip angle, yaw rate, and pitch or roll angle. The system includes a brake/event trigger input that can be used to measure brake stopping distance. ATC staff used load cells at the brake lever and foot pedal to measure applied forces and as an event trigger input to the VBOX. Data from all the sensors are recorded in a Delta data logger from Pi Research, Inc. The data logger is a stand alone device that reads various electrical signals (from the sensors) and stores the data for later download to a computer. After each batch of test runs, the data from the data logger is downloaded to a laptop computer.

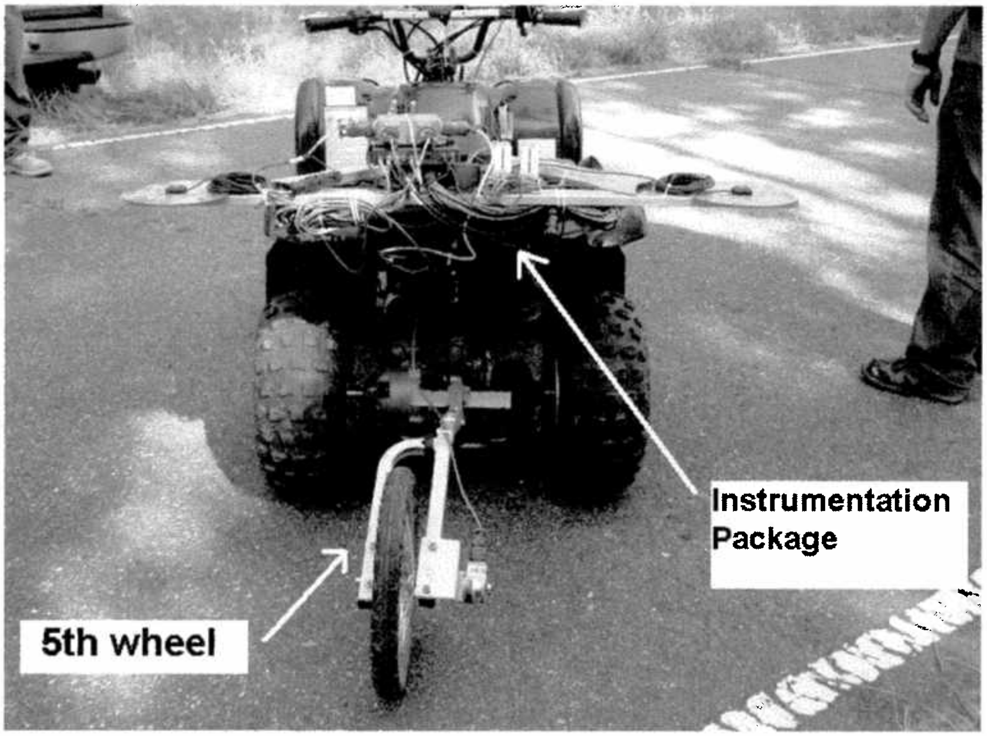


Figure 4. Instrumentation Package With 5th Wheel

The instrumentation package and fifth wheel are used during vehicle speed and brake stopping distance tests. The tests require a flat asphalt or concrete area where maximum speed can be maintained for at least 100 feet. Tests are conducted at ATC's Dynamometer Course which features a bituminous concrete straight roadway that is one mile long, 17 feet wide, and level within 0.1 percent. The test rider drives the ATV at maximum speed for at least 100 feet up and down the length of the test course. ANSI/SVIA 1-2001 requires that a youth ATV intended for children ages 6 and over have a maximum unrestricted speed of 15 mph. The maximum speed for youth ATVs intended for children age 12 and over is 30 mph. The average of all runs (in even numbers) is the maximum vehicle speed. The fifth wheel and VBOX measurements correlated well during maximum speed testing.

Each vehicle's maximum speed is used to determine that vehicle's brake test speed. To conduct the brake tests, the test operator drives the ATV to the brake test speed and applies the brakes. ANSI/SVIA 1-2001 requires that an ATV with a maximum speed greater than 18 mph must be able to brake/decelerate at 0.6g or higher when tested at the brake test speed. The brake stopping distance was measured with the fifth wheel, and is used to calculate deceleration of the vehicle (the procedure is specified in ANSI/SVIA 1-2001). The deceleration is also measured by the Inertial Measurement Unit (IMU).

ANSI/SVIA 1-2001 specifies a hand or foot brake application force range to ensure optimum brake performance. Load cells at the brake levers and foot pedal record the driver's brake application force. The measurements are checked after each run to ensure that the brake application forces are within the range specified in the voluntary standard.

ANSI/SVIA 1-2001 also specifies the vehicle test weight during brake performance tests. For ATVs with a maximum load capacity of 200 lbs or more, the test weight is 200 lbs (this applies to most adult size ATVs which have a maximum load capacity above 200 lbs). For vehicles with a maximum load capacity of less than 200lbs, the test weight is the maximum load capacity of the vehicle. Many youth model ATVs have a maximum load capacity that range from 80 lbs to 200 lbs. An ATV with a maximum load capacity that is less than the combined weight of the test operator and instrumentation (approximately 155 lbs) cannot be tested with the test operator. To test ATVs with a maximum load capacity that is less than 155 lbs, ATC staff designed and fabricated an autonomous brake system (see Figure 5). The system consists of a pneumatic linear actuator rigidly mounted above the brake foot pedal, an air cylinder, air pressure regulator, a pneumatic solenoid, and a radio control system. The test vehicle is instrumented, weighted to the maximum load capacity (ranged from 80 to 100 lbs), brought up to the brake test speed by another vehicle (dragged with detachable hook), and the brakes are actuated via remote control. A load cell is on the brake pedal to ensure brake force application is within the range specified in ANSI/SVIA 1-2001. The stopping distance and deceleration are measured by the fifth wheel and IMU.

Figure 5. Autonomous Brake System

The autonomous brake procedure was developed by ATC staff to meet the test requirements in the voluntary standard. Communications with manufacturers on youth ATV test procedures indicate that the manufacturers commonly use a test weight (comprised of an adult test rider and instrumentation) that exceeds the vehicle load capacity. This failure to adhere to the test weight 52 specified in the voluntary standard is overlooked because their vehicles pass the brake tests with a worse case condition of a heavier test load. However, initial ES testing using the higher test load method resulted in brake test performance failures on the selected vehicles. This prompted the use of the autonomous brake system so that the brakes could be truly evaluated within the parameters of the procedures specified in the voluntary standard.

The instrumentation package without the fifth wheel is used for the turn circle test. The test requires a flat concrete area where the ATV can be driven around a 100 foot diameter circle. Tests were conducted at ATC's Phillips Army Airfield which features one 8,000 x 200 ft runway and two 5,000 x 150 ft runways. The test rider drives the ATV around a 50 ft diameter circle at 5 mph for a baseline measurement of the handlebar steer angle in a steady state turn. The handlebar steer angle is measured by a string potentiometer that is secured to the ATV frame with the string portion attached to a handlebar end (see Figure 6). When the handlebar is turned, the string is displaced and a voltage is produced. The output voltage per string displacement is correlated to degree of handlebar travel for each vehicle. The test driver increases the vehicle speed by 2 mph increments and maintains constant velocity and steer path around the circle. At some point, the vehicle lifts up on two wheels when maximum lateral acceleration is achieved. The tests are terminated at this point. By plotting the handlebar steer angle versus lateral acceleration, the vehicle's steering characteristic (understeer, neutral steer, oversteer) can be determined.

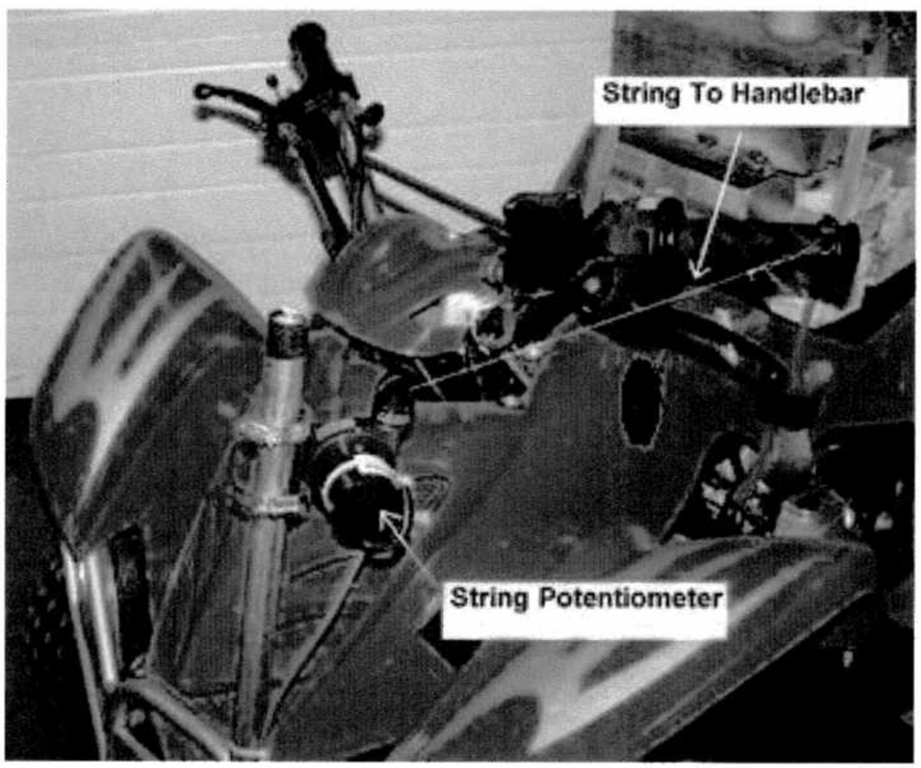


Figure 6. String Potentiometer

Progress

Table 1 indicates the status of each of the nine youth model ATVs in the test and evaluation program as of December 17, 2007:

Test/Measurement	ATV A	ATV B	ATV C	ATV D	ATV E	ATV F	ATV G	ATV H	ATV I
Physical Dimensions	•	•	•	•	•	•	•		
Weight	•	•	•	•	•	•	•		
Center of Gravity	•	•	•	•	•	•	•		
SSF	•	•	•	•	•	•	•		
Moment of Inertia (Yaw)	•	•	•	•	•		•	•	•
Moment of Inertia (Roll/Lateral)									
Moment of Inertia (Pitch)									
Lateral Tilt Angle Static Tilt Table	•		•	•	•		•		•
Pitch Tilt Angle Static Tilt Table	•		•	•	•		•		•
Maximum Speed			•	•			•	•	
Brake Tests			•	•			•	•	
Turn Circle Test		•	•	•	•		•	•	•
Parking Brake	•			•	•		•		•

• = completed

Schedule and Future Action

Staff will focus on completing the test and evaluation program of youth ATVs at ATC, which is expected to run into calendar year 2008. ES staff also plans to expand the effort to comparatively test full-size adult ATVs. Testing of adult-size ATVs is necessary for the following reasons:

- to examine mid-size adult ATVs that may become the next generation of T Category ATVs
- to test and evaluate the ATVs that are involved in injuries and fatalities (the majority of injuries and deaths of children under 16 years of age occur on adult ATVs)
- to examine the effects of rider interaction on ATVs
- to examine the latest technology on ATVs such as power steering and independent rear suspension

Before the next phase of test and evaluation of adult ATVs commences, the data gathered from testing of youth ATVs will be processed and analyzed. ATC staff will provide a complete report and analysis of the test and evaluation of youth ATVs. Insights from the first phase of testing may lead to changes in test methodology and protocols for the next phase of testing.

In order to meet the Commission direction to determine whether making youth model ATVs less rider interactive could reduce deaths or injuries, ES staff is developing in-house test capabilities to support the extensive testing that will be required to fully evaluate which ATV characteristics could possibly be modified to help reduce deaths or injuries on ATVs. Preliminary evaluations on the effects of rider lean on static stability are being conducted in the test and evaluation program effort at ATC. However, further dynamic tests must be developed and performed to evaluate whether less rider interaction could be beneficial.

ES staff has purchased the instrumentation to duplicate the data acquisition capabilities of the system developed by ATC and is working with LS staff to develop autonomous ATV control with robotic steering, throttle, and braking capabilities. Autonomous ATV testing will allow ES staff to perform repeatable tests (that may also be too dangerous to perform with a test operator) to evaluate off-road vehicle stability. In conjunction with developing test capabilities, ES staff is exploring local facilities with areas that can support on-road and off-road tests. With the baseline ATV work from ATC and continued consultation with their vehicle dynamics experts, ES staff will continue to gather technical data on ATVs with the end goal of better understanding ATV stability.

In-house test capabilities will also allow ES staff to support the Office of Compliance in determining an ATV's compliance to voluntary or mandatory performance requirements.

Visit to NHTSA

ES staff visited the National Highway Traffic Safety Administration's (NHTSA) Vehicle Research and Test Center (VRTC) which is located on the grounds of the Transportation Research Center (TRC) Inc. in East Liberty, Ohio. ES staff met with NHTSA/VRTC engineers and presented the technical issues associated with ATV testing, a brief overview of past testing, a summary of ATV characteristics, and preliminary plans to test ATVs. NHTSA/VRTC staff presented an overview of the rollover research testing conducted by VRTC. VRTC was able to relate a vehicle's static stability factor to its risk of rollover according to actual vehicle crash data. This approach was possible because of the high volume of documented accident reports that clearly identify the make and model of the vehicles involved. NHTSA/VRTC engineers also performed extensive rollover resistance research. They developed a programmable steering machine, designed lightweight outriggers, and fully instrumented vehicles with an in-vehicle data acquisition system, triaxial accelerometers, rate sensors (roll, pitch, yaw), and distance measuring systems (wheel lift and roll body angle). With robotic steering and outriggers, VRTC is able to safely perform repeatable maneuvers to assess dynamic rollover resistance. These tests are capable of producing two-wheel lift and repeatable, discriminatory results. The results are used for the New Car Assessment Program (NCAP), a car safety assessment program that awards 'star ratings' based on the performance of a vehicle. These tests also enabled VRTC to develop Federal Motor Vehicle Safety Standard (FMVSS) 126 which requires that Electronic Stability Control (ESC) systems be installed on passenger cars, multipurpose vehicles, trucks, and buses sold in the United States with Gross Vehicle Weight Ratings of (4,536 Kg) 10,000 lbs or less.

Electronic Stability Control (ESC) is a computerized system, consisting of sensors and an electronic control unit (ECU) that is built on top of an anti-lock brake system. The ESC system uses feedback from the sensors to determine what state the driver wants the vehicle to be in and compares that to the actual state of the vehicle. If the vehicle is not going where the driver is steering, the ESC brakes individual front or rear wheels and/or reduces excess engine power to correct the steering. VRTC showed ES staff video footage of the ability of a vehicle with ESC to avoid tip over in a dynamic maneuver with extreme steer angle input (by robotic control). ESC is successful on automobiles because of the predictable nature of the roadway surface and the vehicle steer/feedback/response system. The steering and feedback of an ATV on off-road terrain is very transient, and most importantly, the off-road surface interaction with the vehicle tires is unpredictable. For these reasons, the feasibility of applying current automotive ESC technology to ATVs is unknown.

C

Vehicle Research and Test Center (VRTC)/ National Highway Traffic Safety Administration (NHTSA) and the Transportation Research Center (TRC)

Date of Meeting/Location: April 26, 2007, VRTC, East Liberty, OH

Attendees
CPSC: Caroleene Paul (ESME), Mike Karen (ESME), Mark Kumagai (ESME), Sarah Brown (ESHF)
NHTSA: Garrick Forkenbrock – Project Engineer/Mechanical Engineer, Vehicle Stability and Control, Dr. Riley Garrott – Chief, Vehicle Stability and Control Division, Bryan O'Harra - Mechanical Engineer, Dr. Bruce Donnelly – Division Chief, Pedestrian and Applied Biomechanics.

Purpose: The purpose of this meeting was to:

1. Meet the VRTC/NHTSA engineers working on vehicle stability.
2. Discuss if VRTC/NHTSA test and evaluation methods can be applied to ATVs.
3. View and discuss the instrumentation/measurement hardware used for rollover testing.
4. Discuss the advances in automotive technology to address vehicle stability and handling.
5. Discuss NHTSA's experience in computer modeling of dynamic responses of vehicles.
6. Discuss off-road vs. on-road environment.

Summary of meeting:

Presentation and discussion: CPSC engineering staff presented the technical issues with ATV testing, past testing, ATV characteristics and current test plans (see attached agenda and presentation). VRTC/NHTSA staff presented an overview of the rollover research and testing conducted by VRTC (see attached presentations). CPSC staff discussed differences in off-road and on-road conditions as well as the rider active characteristics of an ATV. The meeting attendees discussed the Static Stability Factor and its correlation to vehicle rollover crashes, vehicle steering characteristics and the use of Electronic Stability Control (ESC).

Laboratory tour: VTRC/NHTSA showed CPSC staff the instrumentation, including robotic steering, inertial measurements, wheel lift measurement techniques and outrigger designs, used for rollover testing. A tour of the hybrid crash test dummy lab was also conducted. Staff discussed the use of instrumented dummies for ATV crash testing.

Transportation Research Center Inc (TRC) – A TRC representative showed the CPSC staff its test facility, including the high speed track, mobility, and durability courses and the ATV test course. TRC can test ATVs and supply a professional rider or, at a reduced cost, the customer can supply the rider. TRC has a safety board that will review and approve a test plan that meets their safety criteria.

Attachments:

1. **Agenda**
2. **CPSC Presentation**
3. **NHTSA Presentation**

Meeting with Consumer Product Safety Commission staff and the NHTSA Transportation Research Center staff

CPSC attendees	NHTSA attendees:
Caroleene Paul, Mechanical Engineer	Garrick Forkenbrock
Mike Karen, Mechanical Engineer	Mike Monk
Sarah Brown, Human Factors Engineer	Riley Garrott
Mark Kumagai, Mechanical Engineer	

Discussion Topics

1. ATV – stability and control characteristics
2. SVIA requirements – 2 inch suspension, pitch factor
3. Past Testing – Turn circle
4. Aberdeen testing
5. NHTSA roll-over testing and instrumentation
6. NHTSA – driver data collection/instrumentation
7. NHTSA modeling
8. Off-road vs. On-road
9. Potential stability test and evaluation methods
10. TRC facility tour.

Consumer Product Safety Commission Staff

meeting with

National Highway Transportation Safety Administration

Subject: All-Terrain Vehicle Testing

Mark Kumagai, mkumagai@cpsc.gov, 301-504-7532
Caroleene Paul, cpaul@cpsc.gov, 301-504-7540
Sarah Brown, sbrown@cpsc.gov, 301-504-7791
Mike Karen, mkaren@cpsc.gov, 301-504-7576

*These comments are those of CPSC staff, have not been reviewed or approved by, and my not necessarily reflect the views of the Commission

April 26, 2007

BACKGROUND

1970: Honda introduces first ATV (3-wheel, 90cc, no suspension)

1984: Honda introduces first 4-wheel ATV

1985: CPSC responds to increasing ATV injuries and fatalities

1985-89: CPSC initiates ATV task force to:

- Study rise in ATV incidents
- Perform technical analyses of ATVs
- Monitor ATV industry activities to address potential hazards

1988: 3-wheel ATVs banned per consent decree; free training initiated; manufacturers agree to not market large ATVs to youth

1990: SVIA publishes ANSI ATV voluntary standard

1990-2005: ATV weights and engine sizes increase

1990-2005: ATV deaths increase to over 500 per year as ATVs grow in popularity

ATV CHARACTERISTICS

ANSI/SVIA Definition: A motorized off-highway vehicle designed to travel on four low pressure tires, having a seat designed to be straddled by the operator and handlebars for steering control.

- Off-road use:
  - low pressure tires; tire/soil interface
  - extreme terrain/large vehicle displacements
  - Significant rider influence on vehicle dynamics
  - Difficulty predicting/repeating test conditions
  - Designed for sport and/or utility use

- Rider "lean" can play a significant role in controlling ATV (i.e. turning, traversing sloped surfaces)

- Weight ratio: dimensions of vehicle are comparable to size & weight of operator

- Differential -- ATVs have solid rear axle

- Range of ATV weights and engine sizes:
  - weight: 200-900 lbs.
  - Eng: youth: 50-90 cc; Adult: 110-700 cc

SVIA/ANSI REQUIREMENTS ASSOCIATED W/ STABILITY

- Mechanical suspension: minimum 2–inch displacement front and rear
- Front and rear brakes (operated independently or by a single control)
- Static pitch stability calculated from vehicle dimensions

Note: Standard has no lateral/dynamic stability or rider-interaction requirements to date.

PAST TESTING

(conducted by CPSC Staff in the mid 1980's)

Pitch (vertical plane) stability:

- Conducted lab vehicle drop tests
- Conducted dynamic testing of ATVs over a ditch/bump environment
- Correlated test results with analytic models
- Concluded full (front & rear), better than front, better than no suspension

Lateral (horizontal plane/turning response) stability:

- Conducted static tilt-table tests
- Conducted dynamic turn circle field tests
- Good correlation between measured and calculated static tilt
- Good correlation between static and dynamic stability (on asphalt)
- Confirmed 4-wheel more stable than 3–wheel ATVs
- ATVs exhibited both over and under steer characteristics

April 26, 2007

CPSC Staff Investigation of ATVs in the mid-1980's

Motion in Vertical Plane

Obstacle Response

- Application of a video-based acquisition and analysis system to examine influence of suspension system.
- Position coordinate of targets on rider and ATV were measured during bump test (14 vehicles, 3 riders).
- Measured displacements, velocities, and accelerations.
- Results correlated to 2 DOF and 4 DOF model analysis and to accelerometer data from lab based whole vehicle drop test.

Ditch/Bump Field Test (Dynamic)	Analytical Model (Static)	Laboratory Vehicle Drop Test
•Max response at 6" and 10mph (profile in SAE paper 891104). •Vertical acceleration measured at 8 targets. •Rotational acceleration of rigid frame measured.	•2DOF model -- explicit and numeric solutions showed suspension better than none. •4DOF model -- showed superior bounce and pitch response for fully suspended ATV.	•Tire/wheel combos tested, load-deflection curves for springing, log decrement for damping. •Vehicle w/200 lbm dropped from 12 inch height. •Log decrement quantification of damping. •Energy loss per cycle of oscillation measured.

Summary:

- Good correlation was found between lab drop test and analytical models with results from field bump test in terms of system performance and suspension characteristics
- Full suspension better than front suspension which is better than no suspension.

Motion in Horizontal Plane

Turning Response

- General coefficient of lateral stability examined for its relationship to lateral acceleration limit in constant-radius steady-state turn-circle tests.
- Moment analysis calculate static stability coefficient Kst, based on vehicle dimensions.
- Tilt table tests measured static stability Ktt.
- Steer angle, velocity, and lateral acceleration measured in turn circle tests, gave dynamic stability coefficient Kd.

Turn Circle Field Test (Dynamic)	Tilt Table (Static)
•55 ft radius on asphalt and dirt (Kda and Kdd). •Increasing speed, went from understeer to oversteer. •Limit on asphalt was tipping versus sliding on dirt. •Kda showed correlation with Kst, higher Kst with higher dynamic stability. •Distinct separation of both Kda and Kst for 3 wheeler, lower lateral stability.	•Kst correlates well with Ktt.

Summary:

- Good correlation found between calculated static stability Kst and tilt table measured static stability Ktt.
- Good correlation found between Kst and dynamic stability in turn circle test on asphalt.
- Stability characteristics of 4-wheel ATV always higher than 3-wheel ATV.
- ATV exhibits both understeer and oversteer characteristics.

April 26, 2007

sheet 6 of 8

PLANNED TESTING (FY07 and 08)

Comparison testing of multiple brands/sizes of ATV's

Compliance with SVIA/ANSI standard
- Max speed
- Stopping distance

Vehicle metrics
- Center of gravity
- Moment of inertia

Vehicle stability testing (static/dynamic/field)
- 3-axis velocity/accel/linear & angular displacement
- Steer angle
- Brake trigger
- Outrigger testing
- Comparison testing w/ vehicle modifications

Environments:
- Varying surfaces
- Varying terrain
- Varying turn radii and maneuvers

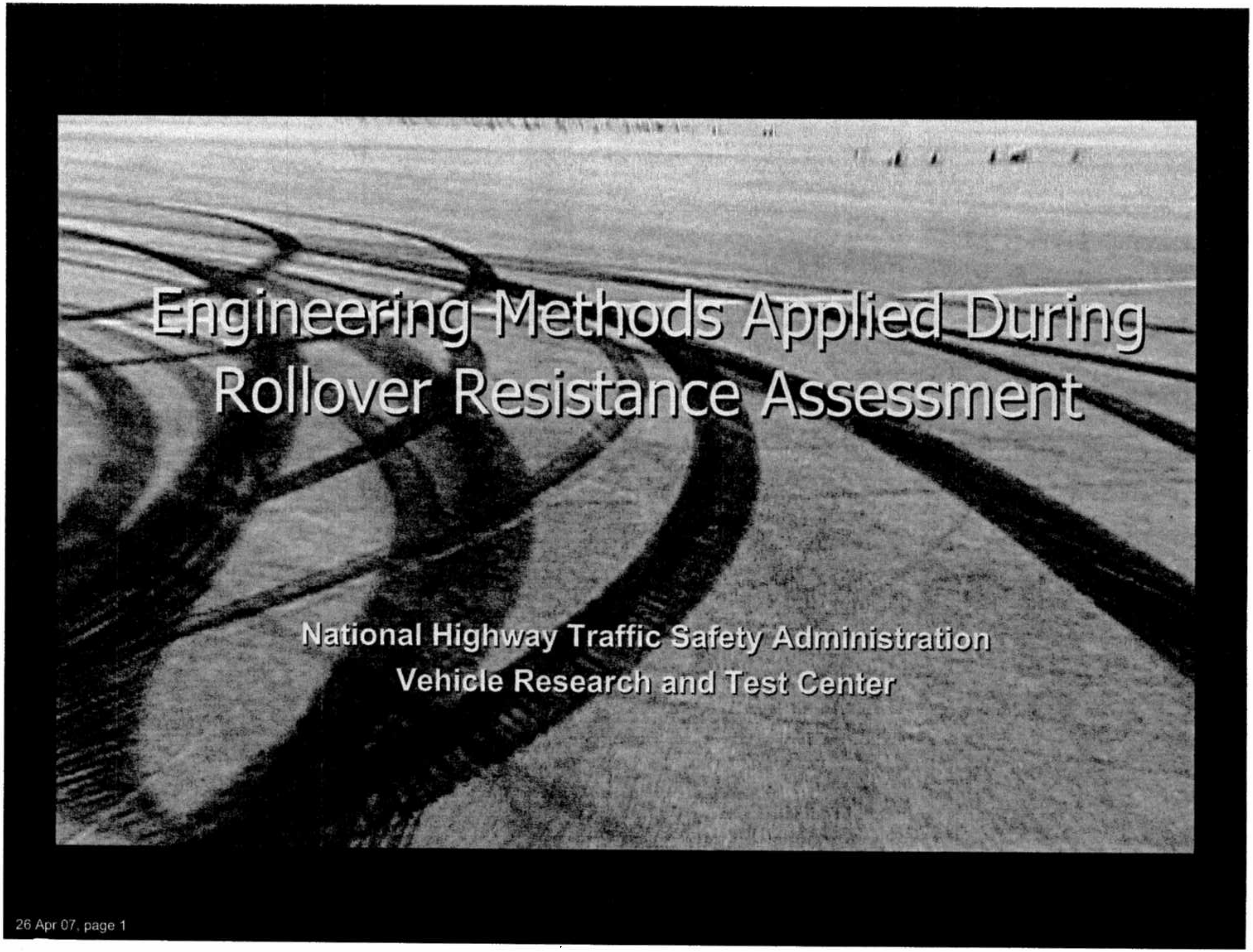
DISCUSSION/CHALLENGES

Things To Discuss With NHTSA

- Lateral stability: developing meaningful performance requirements
- Is ESC (or something similar) feasible on ATVs?
- What types of testing have proven useful and can they be applied to ATVs?
- Relationship between static stability and dynamic stability
- Robotic steering
- What type of stability measurements are meaningful/significant?

Current ATV Effort Challenges

- Unlike 1980's, ATV population is now uniform (all are 4-wheel w/ suspension)
- Distinctions in comparative analysis less obvious
- No "silver bullet" to improve lateral/pitch stability
- Defining repeatable test procedures
- Developing performance requirements
- Choosing meaningful pass/fail values
- Ability to correlate test results in terms of incident/accident reduction


Engineering Methods Applied During
Rollover Resistance Assessment
National Highway Traffic Safety Administration
Vehicle Research and Test Center
26 Apr 07, page 1

Program Responsibilities

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http://www.nhtsa.dot.gov

Instrumentation

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In-Vehicle Data Acquisition System (DAS)

Distance Measuring Systems (Wheel Lift, Body Roll Angle)

Programmable Steering Machine

Vehicle Speed

Accelerometers (Ax, Ay, Az)

Rate Sensors (Roll, Pitch, Yaw)

**Discussed in this presentation*

Technical Highlight:
Programmable Steering Machine

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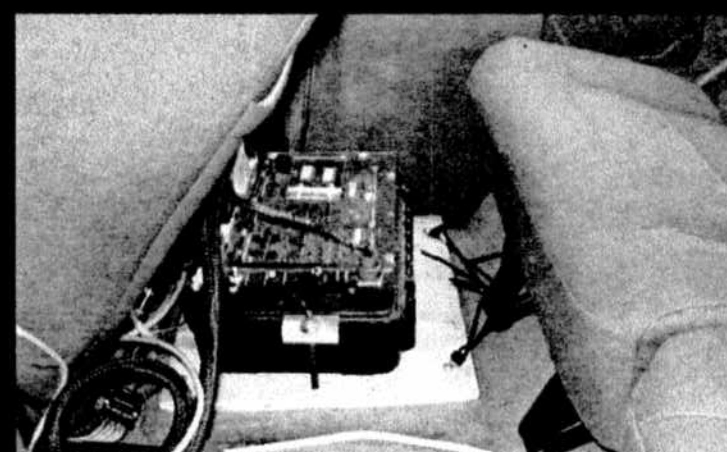
- Provides accurate and repeatable inputs
  - Important for NCAP testing
- Able to receive outputs from other sensors
  - Roll Velocity
  - Vehicle Speed



Technical Highlight:
Programmable Steering Machine

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VIDEO CLIP

Vehicle Loading

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- NCAP Rollover testing specifies a "Multi-Passenger" load configuration
- Achieve via use of 175 lb water dummies
- Three water dummies are typically used, positioned in the second seating row

Design

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- Maneuvers
  - Fishhook maneuver used to assess dynamic rollover resistance for NCAP
  - Optimized to insure high severity
  - Capable of producing two-wheel lift and repeatable, discriminatory results
- Outriggers
  - Designed in-house at VRTC
  - Optimized design
  - Minimizes inertial effects
  - Preserves strength, safety

Example:
Fishhook Maneuver Effectiveness

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Example:
Outrigger Design Optimization

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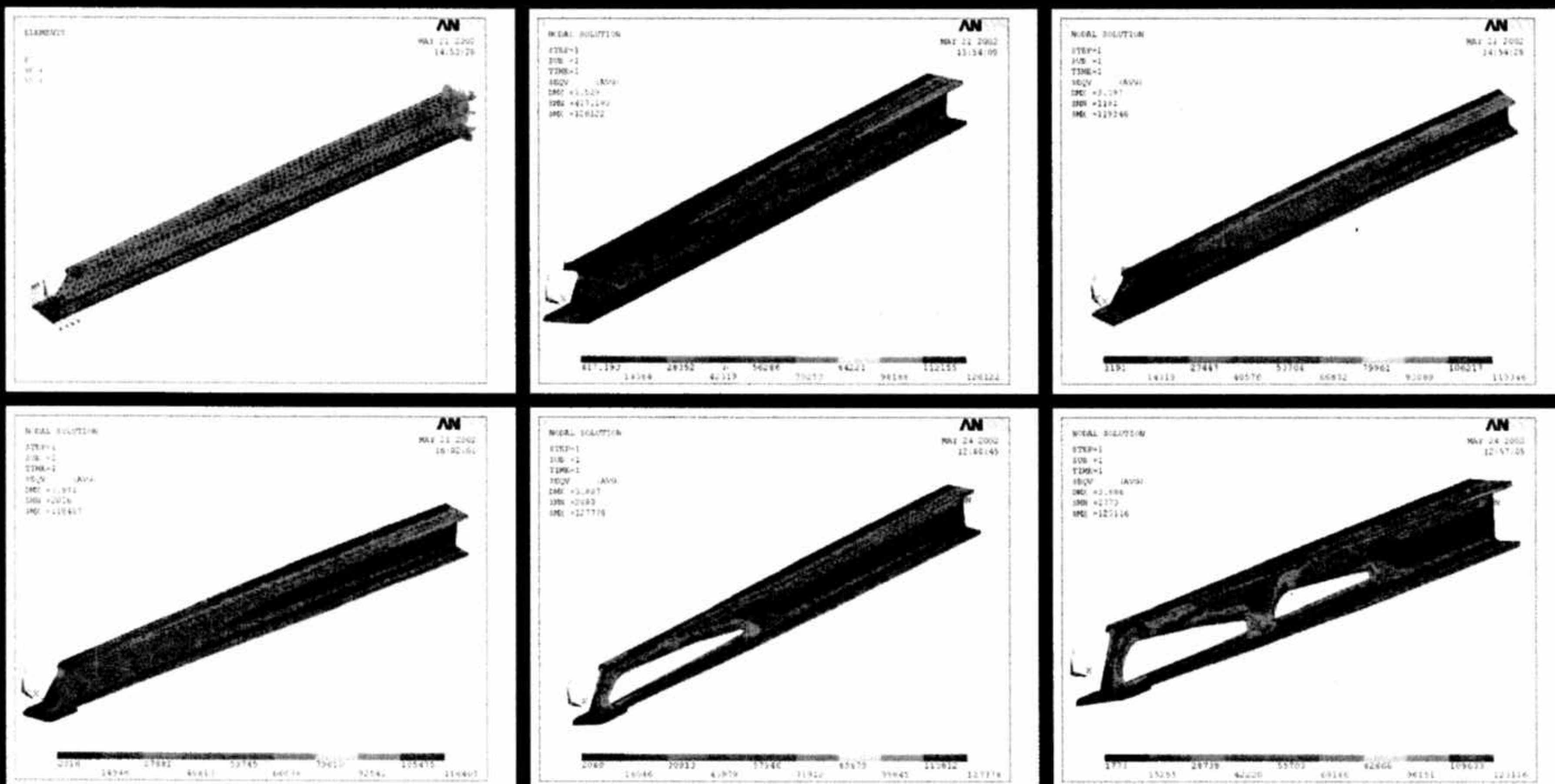

Safety Considerations
Inner tubes

- In addition to outriggers, inner tubes are generally installed in each tire
- Have proven to significantly reduce the occurrence of debeading, loss of inflation pressure, and subsequent test surface damage

Safety Considerations
Maneuver Severity

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- Dynamic rollover testing can be very dangerous
- Important to remember small changes to the input conditions can have a profound effect on test outcome

2003 Ford E-350
NCAP Fishhook
15 Occupants
MES = 48.5 mph
55/80 psi

Analysis

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- Tests data inspected
  - Quality Assurance
- Two-wheel lift determination
  - Simultaneous occurrence of front and rear wheel lift equal to 2" or more

Dissemination

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- NCAP Rollover Ratings
- Reports
  - Document findings
  - Stimulate future research
  - Available online
- Presentations
  - Internal (i.e., NHTSA)
  - To industry
  - SAE World Congress

Additional Information

People Saving People
http://www.nhtsa.dot.gov

- NHTSA's Rollover Docket
  - http://dms.dot.gov/search/searchFormSimple.cfm
  - Docket Number 9663
- VRTC Crash Avoidance Website
  - http://www-nrd.nhtsa.dot.gov/vrtc/ca/vrtc_ca.htm
- http://www.safercar.gov
  - NCAP rollover ratings
  - An excellent overall vehicle safety resource
- Email
  - Garrick.Forkenbrock@dot.gov

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Light Vehicle ESC Performance Test Development

April 26, 2007

Garrick J. Forkenbrock

NHTSA VRTC

Presentation Overview

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- Overview of Safety Benefits
- FMVSS 126
- Sine with Dwell Test Maneuver
- Lateral Stability
- Responsiveness
- Concluding Remarks

ESC Safety Benefits

NHTSA Data

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- Reduction of single-vehicle loss of control crashes
  - Passenger cars: 34%
  - Sport utility vehicles: 59%
- Reduction of single-vehicle rollover crashes
  - Passenger cars: 71%
  - Sport utility vehicles: 84%

FMVSS 126

- Requires ESC systems be installed on passenger cars, multipurpose vehicles, trucks, and buses sold in the United States with Gross Vehicle Weight Ratings of (4,536 Kg) 10,000 lbs or less.
- Is comprised of equipment and test track based performance requirements

Sine with Dwell Maneuver

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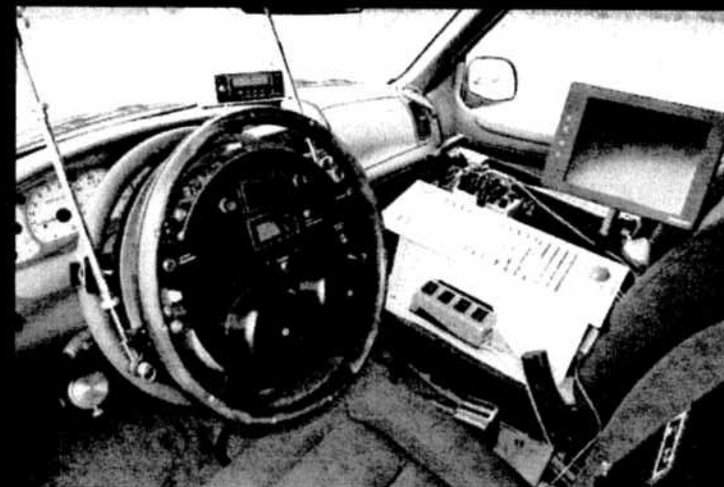
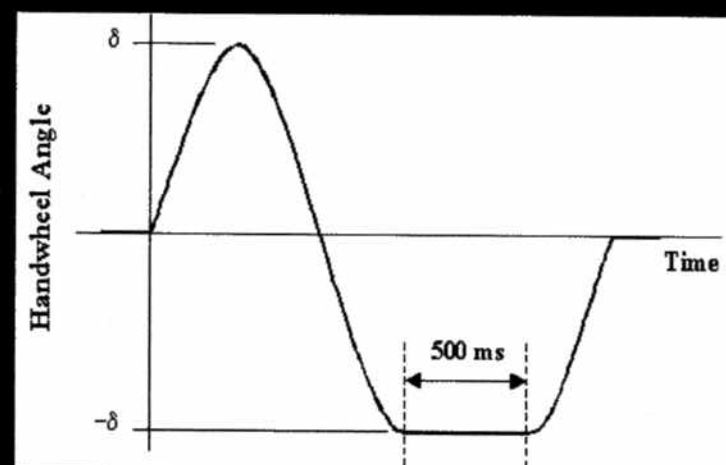
- Only performed with ESC fully enabled
- Performed with a programmable steering machine
- Based on a 0.7 Hz single cycle sinusoidal steering input
- Performed at 50 mph (off throttle only)
- Severity increased with normalized steering angle increments





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Lateral Stability

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- FMVSS 126 contains performance-based criteria to evaluate an ESC system's ability to mitigate excessive oversteer
- Lateral stability is assessed using the concept of "yaw rate ratio"
  - Relates the yaw rate of the vehicle produced by the Sine with Dwell steering reversal to the yaw rate at two instants in time
  - Use of two thresholds encourages yaw rate to decay in a prompt and controlled manner

Intervention Example
2006 Porsche Boxster

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ESC Disabled
(Note occurrence of transient oversteer)

ESC Enabled

Intervention Example
2005 Nissan Titan

ESC Disabled
(Note occurrence of transient oversteer)

ESC Enabled

Lateral Stability Performance

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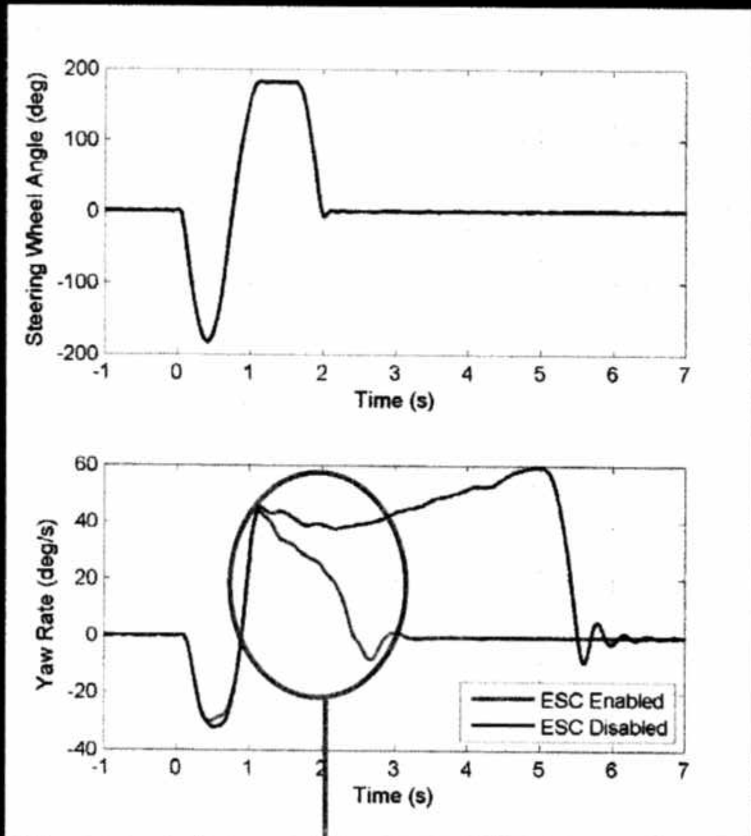
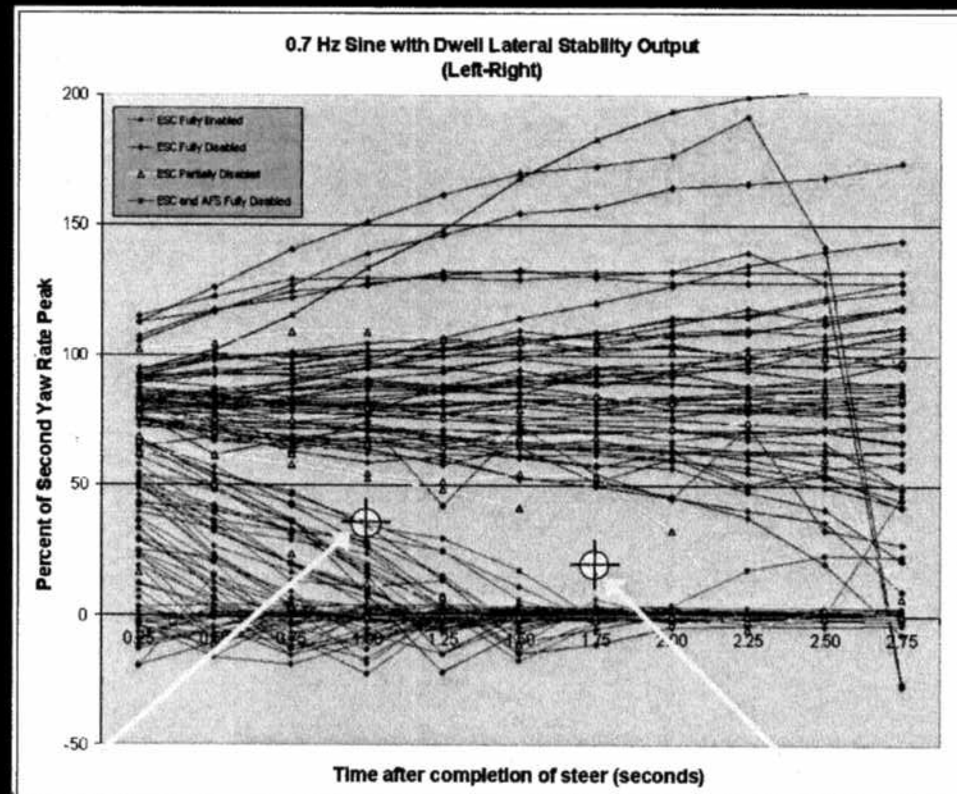


Note yaw rate decay with ESC enabled

Results from 128 vehicle configurations



YRR ≤ 35% 1.0 s after completion of steer

YRR ≤ 20% 1.75 s after completion of steer

Responsiveness

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- FMVSS 126 contains performance-based criteria intended to preserve the vehicle's ability to respond to the driver's steering inputs
- Responsiveness is assessed using lateral displacement (Dy)
  - Calculated via the careful double integration of lateral acceleration
  - Dy measured over a range of normalized steering wheel angles 1.07 seconds after initiation of steer
  - Minimum allowable Dy depends on vehicle GVWR

Responsiveness Performance

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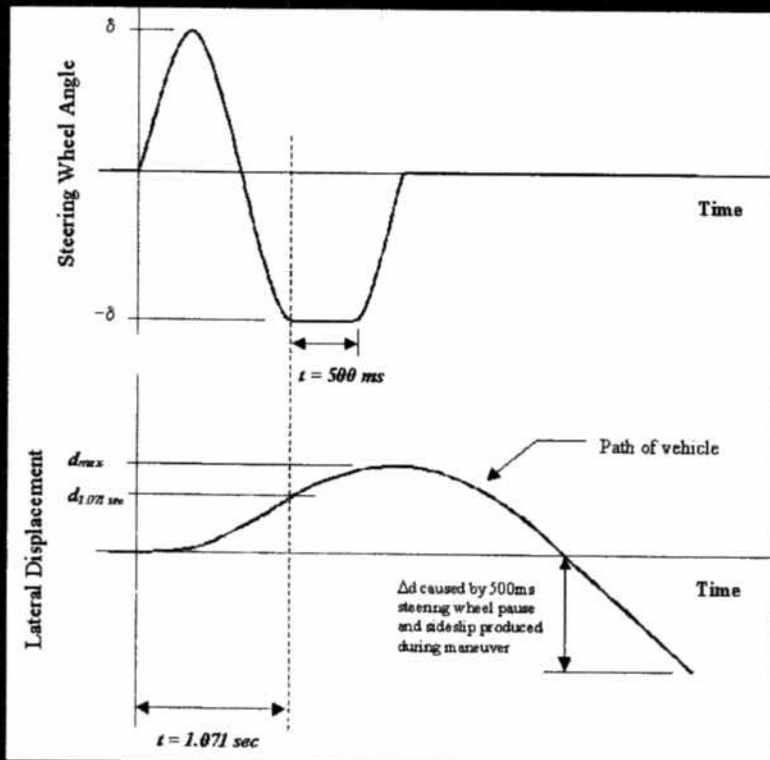
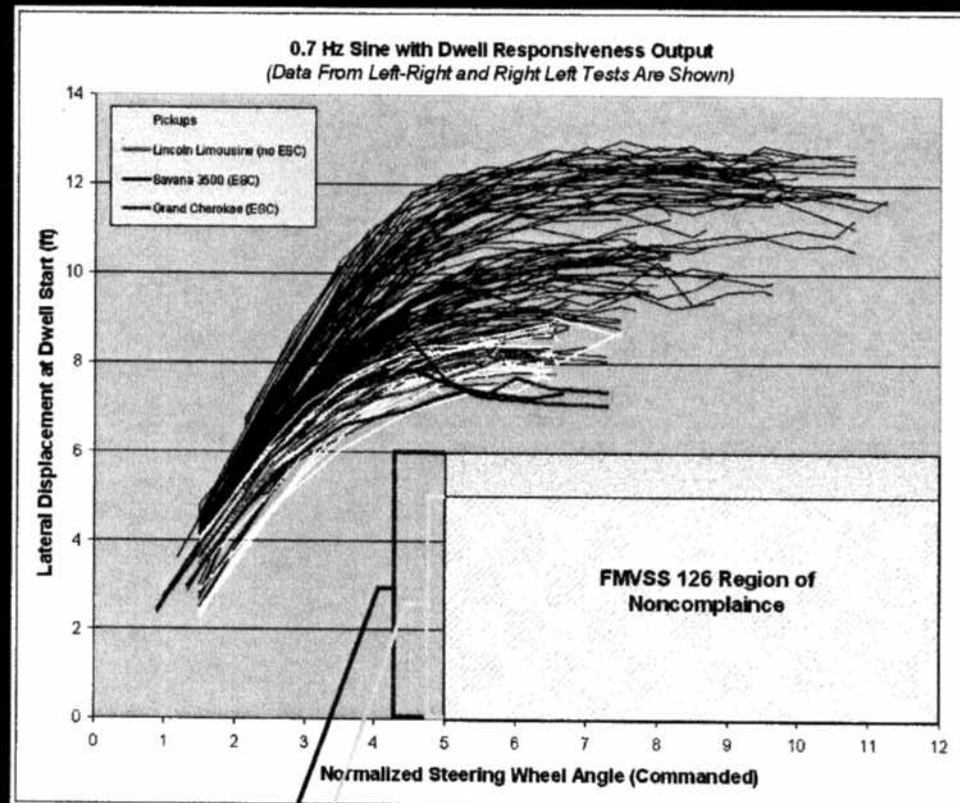
Results from 128 vehicle configurations





If GVWR ≤ 3,500 kg (7,716 lbs), then Dy must be ≥ 6.0 ft

If GVWR > 3,500 kg (7,716 lbs), then Dy must be ≥ 5.0 ft

Concluding Remarks
(applicable to all light vehicles)

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- NHTSA's mandate of ESC is expected to dramatically improve vehicle safety
  - 5,300 to 9,600 lives saved
  - 156,000 to 238,000 injuries prevented
- FMVSS 126 will be used to assess ESC compliance beginning with vehicles produced on September 1, 2008
- With few exceptions, FMVSS 126 will require 100% installation by September 1, 2011

Additional Information

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- NHTSA's ESC Docket
  - http://dms.dot.gov/search/searchFormSimple.cfm
  - Docket numbers 25801 and 19951
- VRTC ESC Website
  - http://www-nrd.nhtsa.dot.gov/vrtc/ca/esc.htm
- http://www.safercar.gov
  - ESC installation information
  - An excellent overall vehicle safety resource
- Email
  - Riley.Garrott@dot.gov
  - Garrick.Forkenbrock@dot.gov

D

Vendors
Federal Business Opportunities

B -- Request for Information-Research Options to Study ATV Drivers under the Age of 16

- Synopsis - Posted on Feb 12, 2007

General Information

Document Type:	Modification to a Previous Presolicitation Notice
Solicitation Number:	Reference-Number-RFI-REQ-4400-07-0005
Posted Date:	Feb 23, 2007
Original Response Date:	Apr 02, 2007
Current Response Date:	Apr 02, 2007
Archive Date:	Apr 17, 2007
Classification Code:	B -- Special studies and analysis - not R&D
Naics Code:	541710 -- Research and Development in the Physical, Engineering, and Life Sciences

Contracting Office Address

Consumer Product Safety Commission, Division of Procurement Services, Division of Procurement Services, 4330 East West Highway, Room 517, Bethesda, MD, 20814-4408, UNITED STATES

Description

Research Options to Study ATV Drivers under the Age of 16

Division of Procurement Services, U.S. Consumer Product Safety Commission (CPSC), 4330 East-West Hwy, Bethesda, MD 20814

Description:

THIS DOCUMENT IS A REQUEST FOR INFORMATION (RFI) ONLY. THE GOVERNMENT DESIRES TO ASCERTAIN INTEREST IN AND CAPABILITY OF PERFORMING, RESEARCH TO STUDY PERFORMANCE AND BEHAVIORAL FACTORS OF YOUTH UNDER THE AGE OF 16 DRIVING ALL-TERRAIN VEHICLES (ATVs) AND TO OBTAIN INPUT ON THE TECHNICAL REQUIREMENTS FOR ANY POSSIBLE RESEARCH.

THE GOVERNMENT DOES NOT INTEND TO AWARD A CONTRACT ON THE BASIS OF THIS RFI OR TO OTHERWISE PAY FOR THE INFORMATION RECEIVED.

BASED ON THE RESULTS OF THIS RFI, IF FUNDING IS AVAILABLE AND A STUDY IS DEEMED REASONABLE, THE GOVERNMENT MAY SUBMIT A FOLLOW-ON ANNOUNCEMENT IN FEDBIZOPPS REQUESTING FORMAL PROPOSALS.

WHEN RESPONDING TO THIS RFI, PLEASE CLEARLY LABEL ALL PROPRIETARY INFORMATION AND ANY OTHER LIMITATIONS ON DISCLOSURE.

DO NOT PREPARE OR SUBMIT PROPOSALS IN RESPONSE TO THIS RFI. THE PURPOSE OF THIS RFI IS TO RECEIVE INPUT FROM TECHNICAL EXPERTS AND OTHER PARTIES ON THE FOLLOWING TECHNICAL REQUIREMENTS. TECHNICAL QUESTIONS AND SUGGESTIONS SHOULD BE ADDRESSED TO THE TECHNICAL POINT OF CONTACT LISTED BELOW. SPECIFIC QUESTIONS ARE LISTED AT THE END OF THE DOCUMENT. RESPONSES TO THIS RFI ARE DUE BY 02 APRIL 2007. SEND RESPONSES TO MS. RUDI JOHNSON, 4330 EAST WEST HIGHWAY, BETHESDA, MARYLAND 20814 OR EMAIL AT RJOHNSON@CPSC.GOV.

CONTACTS:

Technical questions, comments, or suggestions should be directed to Robert Ochsman, Director, Division of Human Factors, 301-504-7686, rochsman@cpsc.gov.

Contracting questions should be directed to: Mrs. Rudi Johnson, rjohnson@cpsc.gov

Introduction:

The CPSC is concerned about the hazards posed to youth under 16 years of age riding All-Terrain Vehicles (ATVs). Incidents related to ATVs can result in death or serious injuries and/or lasting disabilities to youth. CPSC staff has studied ATVs for many years, most recently in responding to a 2002 petition requesting a ban on the sale of adult four-wheeled ATVs for use by children and in developing a briefing package recommending that the Commission approve a Notice of Proposed Rulemaking (NPR) that would set mechanical, labeling, point of sale, instruction, and training requirements for ATVs. The NPR was subsequently approved by the Commission and published in the August 10, 2006, Federal Register.

In 2001, there were an estimated 2.8 million ATV drivers under the age of 16, and another 4.4 million children rode ATVs as passengers. Children under 16 sustained about 31% of the estimated ATV-related injuries in 2001, and the societal costs associated with all medically attended injuries to children under 16 that year are estimated to be $2.5 billion. The societal 95 costs of ATV-related deaths to children in 2001 are estimated to have amounted to about $550 million. Eighty-nine percent of child drivers who were injured were driving an adult ATV at the time. Based on injury and exposure data estimated from surveys conducted in 2001, the risk of injury to drivers under the age of 16 on adult ATVs was roughly twice the risk for child drivers on youth ATVs.

The CPSC staff is considering various means to try to reduce youth deaths and injuries related to ATVs. Since the risk to youth on adult ATVs is much higher than on youth ATVs, CPSC encourages all youth to ride appropriate youth ATVs. For more background information on this issue, please see the staff briefing packages and other documents available on CPSC?s Web site (go to http://www.cpsc.gov/cgi-bin/foia.aspx, select All Terrain Vehicles, and click on Find). The relevant documents with human factors information are as follows (in order of date, beginning with the most recent): (1) CPSC Staff Response Regarding Follow-Up Questions from Commissioner Moore after ATV Safety Review Briefing, dated 07/11/2006, Youth ATVs: Questions 1 through 7 (beginning on p. 3 of 18), and Question 9 (beginning on p.7 of 18); (2) CPSC Staff Response to Commissioner Nancy Nord after the June 15, 2006 ATV Safety Review Briefing, dated 06/30/2006, Question 3 (beginning on p. 3 of 7) and Question 4 (beginning on p.5 of 7); (3) All Terrain Vehicle Initiative, Part 2, dated 05/31/2006, especially Tabs H (p.138 of 229 through p.149 of 229) and I (p.150 of 229 through p.157 of 229); (4) Response to Questions from Commissioner Moore on CP-02-4/HP-02-1; Petition Requesting Ban of All-Terrain Vehicles Sold for Use by Children under Age 16, dated 08/22/2005, Question 8 (beginning on p. 3 of 6); (5) Analysis of Petition CP-02-3/HP-02-1 - Requesting Ban of ATVs Sold for the Use of Children Under Age 16 - Part 3, dated 02/02/2005, especially Tab H (p. 39 of 55 through p. 55 of 55); and (6) Analysis of Petition CP-02-3/HP-02-1 - Requesting Ban of ATVs Sold for the Use of Children Under Age 16 - Part 4, dated 02/02/2005, especially Tab I (p. 1 of 43 through p.6 of 43).

One of the strategies being proposed by the Commission to encourage youth to select appropriate ATVs is to characterize youth ATVs by speed rather than engine size, as is currently done. (A chart showing CPSC?s proposed ATV models and intended ages is available on p. 45908 of the August 10, 2006, Federal Register notice.)

Request:

The CPSC staff is interested in obtaining ideas, data, concepts, and feasibility information for human performance and behavioral research that supports or refutes the ATV requirements proposed for each category listed above. CPSC staff realizes that, while the ideal of eliminating all hazards associated with ATV driving is not feasible, it may be possible to reduce the number of deaths and the severity of injuries, especially to youth.

The category recommendations listed in the above table are based on the existing voluntary standard (American National Standard for Four Wheel All-Terrain Vehicles ? Equipment, Configuration, and Performance Requirements, ANSI/SVIA-1-2001) and on published child development data reviewed by CPSC staff, including research on teen automobile driving. There are, however, factors CPSC staff has been unable to investigate due to the lack of available research regarding youth ATV drivers. CPSC staff is aware of little published data regarding the motorized vehicle driving skills of youth under age 16 even though some youth may have years of experience on dirt bikes and ATVs. CPSC staff therefore would like to consider the feasibility of research specifically focused on youth ATV driving.

General Questions:

Responders should provide descriptions of the options available for obtaining human performance data regarding youth driving ATVs. CPSC staff is particularly interested in the feasibility of obtaining data related to 1) human factors research related to vehicle design factors that may be relevant to youth ATV drivers such as a) appropriate speed, b) appropriate maximum ATV weight and/or driver weight to ATV weight ratio, and c) control design factors that may be specific to youth driving; 2) nighttime off-road driving performance and behavior of youth as compared to youth driving performance during daylight and adult driving performance, both during daylight and at night; 3) youth distractibility while driving ATVs; 4) the effects of peer pressure and the extent to which youth ATV drivers may be more or less susceptible to peer pressure than youth automobile drivers.

Responders should address the following questions in their submissions: 1) What are the possible methods that could be employed to collect the desired data? 2) Are there examples of existing research that have proven successful in collecting the desired data? 3) Is there existing research regarding the off-road driving skills of youth? 4) What other human performance and behavior factors that may be relevant to youth ATV driving could and/or should be studied? 5) Would there be difficulties related to obtaining youth participants for a study of driving behavior (e.g., finding volunteers, research ethics, etc)? 6) What is a reasonable rough estimate of the time, cost, and other resources needed for such a study?

Driving Simulator Specific Questions:

CPSC staff is aware that one possible method for obtaining the needed data may be through use of driving simulators. Responders who are familiar with simulator studies should provide documentation on the technical feasibility of using existing driving simulators to obtain human performance data regarding youth driving ATVs. CPSC staff is particularly interested in the feasibility of obtaining data related to the maximum appropriate speeds for various categories of youth drivers and the nighttime driving performance of youth as compared to youth driving performance during daylight and adult driving performance both during the day and at night.

Responders who wish to address simulator research should also address the following questions in their submissions: 1) Is the study of ATV driving with driving simulators a pragmatic, valid, and cost-effective methodology? 2) Are there existing high fidelity simulators for ATVs or similar motorized vehicles? 3) Can children be successful participants in a driving simulator study? 4) Can driving simulators accurately test nighttime driving skills? 5) Would a simulator be able to accurately reproduce the lighting effects of headlights? 6) Is it feasible to obtain data with a simulator suggesting maximum appropriate speeds for various categories of youth ATVs? 7) What other human performance and behavioral factors could be studied in a driving simulator that may be relevant to youth ATV driving? 8) Would the prevalence of driving-type video games that may be used by youth confound data obtained? 9) How do simulator studies translate to off-road driving conditions? 10) How do participants alter their behavior when using a simulator versus when driving in an actual off-road environment?

How to Respond:

Responses should be in the form of reports or letters discussing the likely success of research projects aimed at acquiring the data listed above, and including factual support for the assertions made therein. If the responder provides a compilation of published example studies from other sources, the results should be summarized.

Responses to this Request for Information (RFI) are to be submitted directly to the

Contracting Office address indicated above, Attn: Rudi Johnson no later than 02 April 2007.

Point of Contact

Rudi Murray-Johnson, Contract Specialist, Phone 301-504-7028, Fax 301-504-0628, Email RJohnson@cpsc.gov - Kimberly Miles, Contract Specialist, Phone (301) 504-7018, Fax (301) 504-0628, Email kmiles@cpsc.gov

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B -- Request for Informatin Only - Mechanical Modeling of All Terrain Vehicles (ATVs) and Biomechanical Modeling of ATV Drivers under the Age of Sixteen (16)

General Information

Document Type:	Presolicitation Notice
Solicitation Number:	Reference-Number-REQ-4400-07-0004
Posted Date:	Feb 21, 2007
Original Response Date:	Mar 30, 2007
Current Response Date:	Mar 30, 2007
Archive Date:	Apr 14, 2007
Classification Code:	B -- Special studies and analysis - not R&D
Naics Code:	541710 -- Research and Development in the Physical, Engineering, and Life Sciences

Contracting Office Address

Consumer Product Safety Commission, Division of Procurement Services, Division of Procurement Services, 4330 East West Highway, Room 517, Bethesda, MD, 20814-4408, UNITED STATES

Description

THIS DOCUMENT IS A REQUEST FOR INFORMATION (RFI) ONLY. THE GOVERNMENT DESIRES TO ASCERTAIN THE EXISTENCE OF, AND/OR INTEREST IN AND CAPABILITY OF CREATING, MECHANICAL AND/OR BIOMECHANICAL MODELS 99

TO ACCURATELY REPRESENT THE INTERACTION BETWEEN ALL-TERRAIN VEHICLE (ATV) WEIGHT AND THE WEIGHT AND/OR PHYSICAL CAPABILITIES OF YOUTH UNDER THE AGE OF 16. THE GOVERNMENT DOES NOT INTEND TO AWARD A CONTRACT ON THE BASIS OF THIS RFI OR TO OTHERWISE PAY FOR THE INFORMATION RECEIVED. BASED ON THE RESULTS OF THIS RFI, IF FUNDING IS AVAILABLE AND A STUDY IS DEEMED REASONABLE, THE GOVERNMENT MAY SUBMIT A FOLLOW-ON ANNOUNCEMENT IN FEDBIZOPPS REQUESTING FORMAL PROPOSALS. WHEN RESPONDING TO THIS RFI, PLEASE CLEARLY LABEL ALL PROPRIETARY INFORMATION AND ANY OTHER LIMITATIONS ON DISCLOSURE. DO NOT PREPARE OR SUBMIT PROPOSALS IN RESPONSE TO THIS RFI. THE PURPOSE OF THIS RFI IS TO RECEIVE INPUT FROM TECHNICAL EXPERTS AND OTHER PARTIES ON THE FOLLOWING TECHNICAL REQUIREMENTS. TECHNICAL QUESTIONS AND SUGGESTIONS SHOULD BE ADDRESSED TO THE TECHNICAL POINT OF CONTACT LISTED BELOW. SPECIFIC QUESTIONS ARE LISTED AT THE END OF THE DOCUMENT. RESPONSES TO THIS RFI ARE DUE BY MARCH 30, 2007. SEND RESPONSES TO MRS. KIM MILES,CPSC, 4330 EAST WEST HWY, BETHESDA, MARYLAND 20814 OR EMAIL AT KMILES@CPSC.GOV. Technical questions, comments, or suggestions should be directed to Robert Ochsman, Director, Division of Human Factors, 301-504-7686, rochsman@cpsc.gov. Contracting questions should be directed to: Mrs. Kim Miles, kmiles@cpsc.gov. RFI TECHNICAL INFORMATION: Mechanical Modeling of All-Terrain Vehicles and Biomechanical Modeling of Youth Drivers. The CPSC is concerned about the hazards posed to youth under 16 years of age riding all-terrain vehicles (ATVs). Incidents related to ATVs can result in death or serious injuries and/or lasting disabilities to youth. CPSC staff has studied ATVs for many years, most recently in responding to a 2002 petition requesting a ban on the sale of adult four-wheeled ATVs sold for use by children and in developing a briefing package recommending that the Commission approve a Notice of Proposed Rulemaking (NPR) that would set mechanical, labeling, point of sale, instruction, and training requirements for ATVs. The NPR was subsequently approved by the Commission and published in the August 10, 2006, Federal Register. In 2001, there were an estimated 2.8 million ATV drivers under the age of 16, and another 4.4 million children rode ATVs as passengers. Children under 16 sustained about 31% of the estimated ATV-related injuries in 2001, and the societal costs associated with all medically attended injuries to children under 16 that year are estimated to be $2.5 billion. The societal costs of ATV-related deaths to children in 2001 are estimated to have amounted to about $550 million. Eighty-nine percent of child drivers who were injured were driving an adult ATV at the time. Based on injury and exposure data estimated from surveys conducted in 2001, the risk of injury to drivers under the age of 16 on adult ATVs was roughly twice the risk for child drivers on youth ATVs. The CPSC staff is considering various means to try to reduce youth deaths and injuries related to ATVs. Since the risk to youth on adult ATVs is much higher than on youth ATVs, CPSC encourages all youth to ride appropriate youth ATVs. However, CPSC staff is aware that current youth models may not fit youth physically. For more background information on this issue, please see the staff briefing packages and other documents available on the CPSC Web site (go to http://www.cpsc.gov/cgi-bin/foia.aspx, select "All Terrain Vehicles", and click on "Find"). The relevant documents with human factors information are in the Web site listing as follows (by date, beginning with the most recent): (1) CPSC Staff Response Regarding Follow-Up Questions from Commissioner Moore after ATV Safety Review Briefing, dated 07/11/2006: Youth ATVs - Questions 1 through 6 (beginning on p. 3 of 18) and Question 9 (beginning on p. 7 of 18); (2) CPSC Staff Response to Commissioner Nancy Nord after the June 15, 2006, ATV Safety Review Briefing, dated 06/30/2006: Question 3 (beginning on p. 3 of 7); (3) All Terrain Vehicle Initiative, Part 2, dated 05/31/2006, especially Tab H (p. 138 of 229 through p. 149 of 229), (4) Response to Questions from Commissioner Moore on CP-02-4/HP-02-1, Petition Requesting Ban of All-Terrain Vehicles Sold for Use by Children under Age 16, dated 08/22/2005: Question 8 (beginning on p. 3 of 6); (5) Analysis of Petition CP-02-3/HP-02-1 - Requesting Ban of ATVs Sold for the Use of Children Under Age 16 - Part 3, dated 02/02/2005, especially Tab H (p. 9 of 55 through p. 55 of 55); and (6) Analysis of Petition CP-02-3/HP-02-1 - Requesting Ban of ATVs Sold for the Use of Children Under Age 16 - Part 4, dated 02/02/2005, especially Tab I (p. 1 of 43 through p. 6 of 43). One of the strategies being proposed by the Commission to encourage youth to select appropriate ATVs is to characterize youth ATVs by speed rather than engine size, as is currently done. (A chart showing the CPSC proposed ATV models and intended ages is available on p. 45908 of the August 10, 2006, Federal Register notice.) While this may provide youth with a viable and appealing youth-specific alternative to a larger, heavier, faster adult ATV, concerns have been raised that this might allow the availability of youth ATVs that would be too heavy for youth and that would cause a crushing hazard. The question has arisen as to whether there is an appropriate or suitable youth ATV weight and/or ratio of ATV weight to driver weight for youth ATVs. REQUEST: CPSC staff has identified several important factors that would need to be considered regarding a suitable weight or weight ratio for youth ATVs. First, the ATV should be sufficiently heavy to reduce the effect a heavy youth would have on the systems center of gravity. Second, ideally the weight of the ATV should not pose a serious crushing hazard to the child if the ATV were to roll over onto the child. Ideally, the child should be able to right the ATV should it roll over. Lastly, the child must be strong enough to physically control the ATV; however, control depends on many factors other than simply strength, such as speed, terrain, rear differential type, and other ATV design factors. To this point, staff has not been able to quantify a relationship between the varying factors. CPSC staff realizes that, while the ideal of eliminating all hazards associated with ATV driving is not feasible, it may be possible to reduce the number of deaths and the severity of injuries, especially to youth. CPSC staff is interested in obtaining ideas, data, concepts, and feasibility information related to modeling and simulating the interplay among the factors mentioned above. The information sought would indicate the potential of methods that may eventually allow staff to develop recommendations for ATV weight based on the age and/or weight of the youth. CPSC staff therefore would like to consider the feasibility of research specifically targeted at creating a model representing ATV behavior and simulating the interaction between ATV behavior, ATV characteristics, and the youth driver, over representative models of off-road terrain. GENERAL QUESTIONS: Responders should provide documentation of the potential options available to model the relationship between youth drivers and their ATVs. CPSC staff is particularly interested in the feasibility of developing/using models that: 1) quantify muscle forces required to successfully control an ATV at various speeds and on various off-road terrains, 2) provide flexibility to represent different size and weight ATVs and different size and weight youth, and 3) represent youth driving ATVs. Responders should also address the following questions in their submissions: 1) What are the possible methods that could be employed to create the desired model? 2) What are some examples of similar models? 3) Are there existing finite element models of ATVs and/or what data is needed to create one? 4) Is there another method that could be employed to determine the optimal youth-ATV weight relationship? 5) What other factors influence the optimum weight? 6) Is there a software solution that could be used by CPSC staff with minimal training? 7) What is a reasonable rough estimate of the time, cost, and other resources needed to create such a model and simulation? HOW TO RESPOND: Responses should be in the form of reports or letters discussing the likely success of research projects aimed at acquiring the data listed above, and including factual support for observations made therein. If the responder provides a compilation of published example studies from other sources, the results should be summarized. If examples of animated simulations are included, they should be readable by a DVD player or a Windows-based computer. Responses to this Request for Information (RFI) are to be submitted directly to the Contracting Office address indicated above, Attn: Mrs. Kim Miles no later than March 30, 2007.

Point of Contact

Kimberly Miles, Contract Specialist, Phone (301) 504-7018, Fax (301) 504-0628, Email kmiles@cpsc.gov - Donna Hutton, Contracting Officer, Phone (301) 504-7009, Fax (301) 504-0628, Email dhutton@cpsc.gov

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E

UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
WASHINGTON, DC 20207

Memorandum

Date: February 12, 2008

TO : Elizabeth Leland, Project Manager, All Terrain Vehicles

THROUGH: Gregory Rodgers, AED, Directorate for Economic Analysis GBR

FROM : Robert Franklin, Directorate for Economic Analysis

SUBJECT : Practical Feasibility of Requiring Pre-Purchase Training for ATV Purchasers

The Commission asked the staff to address the issue of whether it would be practical or feasible for the Commission to require that all terrain vehicles (ATVs) only be sold to first-time ATV purchasers who have completed an ATV safety course and present proof of successful completion. This memorandum only addresses non-legal factors that might impact the Commission's ability to establish a pre-purchase training requirement. It does not consider whether the legal authority for such a requirement exists. Any question regarding legal authority would have to be addressed by the Office of the General Counsel.

Differences Between Current Voluntary Training Programs and Requiring Pre-purchase Training

Under the voluntary training program offered by the ATV Safety Institute (ASI), the offer of training is tied directly to the purchase of a new ATV. The consumer is informed by the ATV dealer or the ASI of the availability of free training. If the purchaser decides to take the safety training, the ATV manufacturer pays the course fee.

Under a pre-purchase training requirement, the training would not be directly tied to the purchase of an ATV since the training would have to be completed before an ATV is purchased. At the time of training, the prospective ATV purchaser might not have settled on the specific ATV model desired and could even decide not to purchase an ATV after completing the training course. Because manufacturers would not be assured of a sale, it is likely that the potential purchasers would bear the full cost of the training up front. However, many ATV manufacturers might be willing to reimburse at least some of the cost of the training for someone who subsequently purchases an ATV from them, as some now do under the ASI "Try Before You Buy" program.

Currently, most of the manufacturers that voluntarily offer free training do so through ASI. However, other organizations also offer ATV safety training, including 4-H clubs and some state and local agencies. Other types of organizations that could offer ATV safety training include ATV enthusiast organizations, educational institutions (e.g., community colleges), and manufacturers or dealers that are not associated with the ASI. Presumably, a potential first-time ATV purchaser would be free to take the training from any qualified training provider.

Administration of Requirement

A *national* pre-purchase training requirement might require that training requirements be more precisely established, that procedures be developed to approve the programs offered by different providers, and that some means be developed by which ATV dealers can identify first-time purchasers who have successfully completed the training. None of these would necessarily be difficult to accomplish, but they would probably require substantially more resources than are now needed to administer the existing programs. The costs to the CPSC would also rise since it would have to closely monitor the content and administration of the training programs.

Establishing course requirements and approving programs. As noted above, several organizations could offer ATV safety training. Because the programs offered by different providers could have somewhat different curricula and emphases, it would be necessary to review the courses to ensure that they meet the requirements for the pre-purchase safety training requirement.

Other questions may need to be addressed. For example, could a program certify a person as "trained" if he or she passes a written safety exam and an ATV driving test (perhaps analogous to the tests required to obtain a driver's license in most states) without having to formally take a training class? Would safety training programs in other countries (e.g., Canada or Mexico) satisfy the pre-purchase training requirement?

Certificates. Certificates or other means to identify individuals who have successfully passed the training would need to be developed. These would be used by ATV dealers to identify those individuals who have completed the training requirement. The certificates would probably need to be difficult to counterfeit. For example, a specific certificate on difficult to copy paper might be used. Additionally, each certificate might contain a unique serial number identifying the trainee. A national register of those that have completed approved ATV safety courses may need to be established and maintained in order to verify that a person has successfully completed the training if the original certificate is lost or to reduce the risk of forged certificates being used.

Identifying First Time Purchasers

Some means that will allow dealers to identify people who have not previously owned an ATV would need to be developed. The easiest method would be for the dealer to simply ask the person if they have owned an ATV before. However, this method would easily allow one to avoid the pre-purchase training requirement by simply claiming to have previously owned an ATV. Therefore, more formal procedures to identify first time purchasers might be desired.

What would constitute proof of prior ATV ownership? If some proof of prior ownership is desired, it will be necessary to determine what documentation would be sufficient. Among the possible documents would be sales records of prior purchases that clearly identify the ATV and the purchaser. ATV registration records or title documents might also provide sufficient evidence. However, several problems might arise with each of these. Owners might not have sales records for ATVs that were purchased several years ago. For ATVs that were purchased second hand, the sales documents might not be complete. Forty-one states (as of August 2007) require that ATVs be registered or titled, but there are some differences in the requirements from state to state. Moreover, it is not known how thoroughly the registration and title laws are complied with or enforced. Therefore, it might be necessary to establish national standards for ATV registration so that persons who have previously owned ATVs can be clearly identified.

Experienced drivers that have not owned ATVs. Another problem might be presented by experienced ATV drivers who have not actually owned an ATV themselves and might resent a requirement that they take a beginning ATV safety course. These could be people who have frequently driven ATVs belonging to family members or friends. A provision that allowed people to be exempted from the training requirement by demonstrating their knowledge and skill in a written and driving test could reduce the burden of the pre-purchase training requirement for these individuals.

Applicability to children or to youth ATVs. It would have to be determined how a pre-purchase training requirement would apply to children under the age of 16 years or to youth ATVs. Since it is unlikely that a child would actually be the purchaser of an ATV, would the pre-purchase training requirement then apply to the children for whom the ATVs are intended or to the adults who purchase the ATVs? If the requirement applies to the children for whom the ATVs are intended, this requirement might be a disincentive for purchasing youth models. Parents who are experienced ATV riders might opt to teach their children to ride adult model ATVs rather than incurring the cost of formal ATV training before purchasing youth models.

Making the requirement apply only to purchasers born after a certain date. The costs of identifying a first-time purchaser could be reduced if the pre-purchase training requirement applied only to persons born after a certain date, rather than to "first-time" ATV purchasers. For example, if the requirement applied to people born after 1990, in 2008, the requirement would apply to anyone 18 years of age and younger that was attempting to purchase an ATV. In 2009, the requirement would apply to anyone 19 years of age and younger, and so on. This type of requirement would be less costly to enforce than requiring all potential purchasers to either show proof of training or proof of prior ATV ownership. Over the years, this type of requirement would ensure that all new ATV purchasers would be trained. However, it does not prevent a person who was trained from selling or giving an ATV to a person that was not trained.

Impact on the Cost of the Training

As described below, a requirement for pre-purchase safety training for first-time ATV purchasers could increase the cost of ATV safety training per person over the cost of the current ASI-sponsored training.

Provision of ATVs for training. Most people who take advantage of the ASI-sponsored training have recently purchased ATVs and use their own ATVs for the "hands-on" portion of the training. If pre-purchase training is required, more ATVs will have to be provided by the training organizations. This will increase the cost of the training since the rental cost of the ATVs used in the training will have to be included in the cost of the training. The rental cost would cover the depreciation, storage, fuel, maintenance, and transportation of the ATVs used in training.

Increase in demand. Currently, only about 25 to 35 percent of first-time ATV purchasers take advantage of the free training opportunity offered by ATV manufacturers.[1] Therefore, if an enforceable requirement for training for all first-time ATV purchasers was implemented, it could significantly increase the number of people seeking training. Unless there is currently a significant overcapacity in the number of ATV safety training opportunities, the increase in demand can be expected to increase the price of the training. It is the increase in the price of training that will induce more people to offer themselves as trainers and lead to more facilities being made available for training.

If the price of training is not allowed to rise (e.g., if it were artificially held at current levels), then some other means will be required to increase the quantity of training available. These could include subsidies from government agencies or perhaps the ATV industry. However, while subsidies might keep the price of training low for participants, subsidies would actually simply shift the costs from the persons being trained to others, such as taxpayers or ATV manufacturers. If the quantity of training available is not increased then some other form of rationing will occur. For example, there might be a longer wait for an available training class or people may have to travel further to get trained.

Summary and Conclusions

If CPSC has the legal authority to establish a national pre-purchase training requirement for first-time ATV purchasers, it would be possible to do so. A pre-purchase training requirement is likely to increase the cost of ATV safety training per person over the cost of the training currently provided by organizations such as the ASI because it is likely to increase the demand for the training and because the organizations that provide the training would also have to provide the ATVs for the hands-on portion of the training. A provision that allowed people to be certified by passing a written and driving test without taking a formal course might mitigate some of the cost increase. Some of the cost increase could also be mitigated if the requirement focused on people born after a certain date rather than on all first-time ATV purchasers.

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[1] Mike Mount, spokesperson for ASI, quoted in Amy McConnell-Schaarsmith, "ATVs: Dangerous Diversion," The Sun-Herald, Biloxi, Mississippi (31 January 2007).

Establishing and administering a pre-purchase training requirement would require substantially more resources than ATV manufacturers and the CPSC currently devote to ATV safety training. These resources would be required to develop the standards for the training courses and various on-going enforcement and administrative functions that might be required, such as ensuring the courses meet the requirements and maintaining a register of people who have completed the training. It also might be necessary to develop a national register of ATV owners so that people who have previously owned ATVs can be identified. The cost of the register of ATV owners could be avoided if the requirement focused on ATV purchasers born after a certain date rather than first-time ATV purchasers.

A pre-purchase training requirement would not address the problem of untrained ATV riders who purchase second-hand ATVs, nor would it necessarily address the problem of ATV owners who allow untrained persons, including children, to ride their ATVs.

F

UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
4330 EAST WEST HIGHWAY
BETHESDA, MD 20814

Memorandum

Date: February 13, 2008

TO : Elizabeth Leland, Project Manager, ATV Project
Directorate for Economic Analysis

THROUGH: Hugh M. McLaurin, Associate Executive Director,
Directorate for Engineering Sciences
Robert B. Ochsman, Director, Division of Human Factors,
Directorate for Engineering Sciences

FROM : Sarah B. Brown, Engineering Psychologist, Division of Human Factors,
Directorate for Engineering Sciences

SUBJECT : Human Factors Staff FY 2008 Research Recommendations for All-Terrain Vehicles

Introduction

In July 2006, the Commission directed the Consumer Product Safety Commission (CPSC) staff to take various actions with regard to all-terrain vehicles (ATVs) including determining if the top speed of thirty miles per hour for the teen youth model is excessive and whether reducing the speed would reduce or eliminate deaths and injuries on those vehicles. The Human Factors (HF) staff has developed three action plans for fiscal year 2008 that may provide insight to ATV usage.

These actions plans are a process to better understand ATV rider capabilities, limitations, behaviors, motivations, and responses. Each action item is a puzzle piece to a complete understanding of the complex ATV/rider system. The HF staff anticipates that several design recommendations would result from the outlined research. Current speed recommendations in the August 10, 2006 Notice of Proposed Rulemaking (NPR) are based on the CPSC *Age Determination Guidelines* and the previous American National Standards Institute Inc. (ANSI) voluntary standard.[1] Future research would serve to provide information relative to current recommendations.

In FY 2008 staff will pursue Actions I, II, and III.

[1] For current speed recommendation discussion see Tab H- Johnson, H.E. (2006) "ATV Age Guidelines" in Notice of Proposed Rulemaking, August 10, 2006.
The current ANSI/SVIA standard was revised in 2007; the previous version was last revised in 2001. ANSI/SVIA 1-2001, The American National Standard for Four Wheel All-Terrain Vehicles--Equipment, Configuration, and Performance Requirements

Action I. Focus Group and One-on-one Interviews (To be contracted out) (~$90K and ~2 month staff time)

Qualitative research, such as focus groups and one-on-one interviews, will be used to discuss motivation, attitudes, and beliefs about ATV usage and speed. The research will be conducted in various regions of the U.S. and target various groups to obtain a wide range of views. Results from this research will be used to address comments submitted to the NPR and to help develop CPSC staff guidelines.

Research should be conducted with several different groups including children ages 6 through 15, parents who ride ATVs and also have children who ride ATVs, and parents who do not ride but allow their children to ride ATVs. If possible, the researchers should find a group of parents who allow their children to only drive youth ATVs and a group of parents who allow their children to drive adult ATVs. It may be found that demographics, such as gender and location, influence people's attitudes and behavior.

While appropriate speeds for children cannot and should not be addressed by a simple survey given to parents, CPSC staff believes it's important to replicate the survey that was cited in the comments to the NPR but with the questions posed more objectively. The research should address the true "appeal factor" for children to drive adult ATVs. The appeal factor should focus on the thought processes and decision making while actually choosing to drive the ATV, rather than choosing an ATV based on speeds shown on a piece of paper. For example, it may be found that if a youth ATV looks "cool" and is larger, this may be enough to discourage a child from driving an adult ATV (it may be that the ATV appearance is a stronger appeal factor than ATV speed). The research should also examine how to keep children off adult ATVs when there is no youth ATV alternative for a child.

One-on-one interviews with individual participants will also be conducted to examine how people respond in a more private setting without possible social or peer influence. A focus group conducted by the National Highway Traffic Safety Administration (NHTSA) on Teen Unsafe Driving Behavior used an affinity group which consisted of a smaller group of friends with the intent of achieving a more open and deeper conversation. The study examined response differences in four cities between males and females; generic, safer, and riskier drivers; focus groups and affinity groups. It will be useful to examine and possibly emulate NHTSA's research methods.

Action II. Consumer Opinion Forum- Questions for ATV owners and non-owners. (Done in-house) (Only staff time required, ~1 month)

The Consumer Opinion Forum is a cost effective resource for any additional questions that should arise after the focus groups and one-on-one interviews. Such questions could address ATV ownership, permission, and supervision. The questionnaire should take less than 15 minutes, therefore limited information may be obtained, but it would be good for quickly reaching a large group of people.

Action III. Incident Reconstruction Interviews (~$20K, ~3 months staff time)

In depth interviews with person(s) involved in ATV incidents may help us gain a better understanding of behavior and motivation, as well as the physical actions and ATV response that led to the incident. Interviews with survivors of ATV incidents are far more telling than IDI fatality reports. A human factors and mechanical engineering team will be formed to interview person(s) involved in an incident along with the field investigator assigned to that region. The team should also speak with the parent, any witnesses, and if possible, the dealer where the ATV was bought and/or serviced. Around ten investigations are recommended. Additional cost and staff time may include taking accident reconstruction courses or talking with National Transportation Safety Board officials who routinely visit automobile, airplane, train, etc. accident sites.

Future Steps

Upon completion and analysis of the three aforementioned actions, it is likely we will need to conduct a long-term empirical study to gain insight to actual ATV rider behavior.

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UNITED STATES
CONSUMER PRODUCT SAFETY COMMISSION
WASHINGTON, DC 20207

Memorandum

December 5, 2007

TO : Elizabeth Leland, Project Manager, ATV Safety Review Team

THROUGH: Julie Vallese, Director, Office of Information and Public Affairs

FROM : Scott Wolfson, Deputy Director, Office of Information and Public Affairs

SUBJECT : Review of ATV Education Efforts in 2007

The information and education campaign carried out by the U.S. Consumer Product Safety Commission in 2007 was based on one overarching principle: if ATV riders can be convinced to wear a helmet each time they ride, only use their four-wheelers on off-road surfaces, never have a passenger on single-rider vehicles, and never allow those younger than 16 to ride adult-size ATVs, then deaths and injuries would decline immediately and dramatically.

In anticipation of the increased number of ATV-related fatalities and serious injuries that occur each summer and fall, the Office of Information and Public Affairs developed and implemented a Rapid Response program. The initiative was mirrored after the U.S. Fire Administration's highly respected Quick Response program[1]. The program design revolved around Public Affairs staff providing real-time responses to broadcast, print, radio and wire services with ATV safety information upon learning of a death or serious injury. The goal of this approach was to prevent future incidents in a given community by obtaining news coverage that promoted safe riding practices and/or warned against unsafe riding practices, or by airing CPSC's public service announcements.

The Rapid Response program was conducted as follows:

- Twice a day, a designated public affairs specialist searched the Internet for ATV-related deaths and injuries.
- The Public Affairs Specialist and Deputy Director coordinated on messaging and approach for following up with media on all reported incidents in which sufficient information was obtained to determine how the incident could have been avoided.
- Broadcast, print, radio and wire services in the affected community were provided with TV and/or radio PSA and one-page fact sheets.
- "Fact sheets" were made available covering the following safety issues:
  - Training
  - Gearing Up
  - No children younger than 16 on adult size ATVs
  - Don't Ride Tandem
  - Don't Ride on Pavement
- Public Affairs staff also promoted ATVSafety.gov, provided national and state data, and highlighted the need for all riders to comply with state laws.

[1] The United States Fire Administration uses a network of public information officers and contract public relations staff to track and respond daily to each fire fatality that occurs around the country: www.usfa.dhs.gov/media/quick_response/. Fact sheets and statistics are faxed and e-mailed to local reporters, follow-up calls are made, and prevention messages are encouraged to be shared with the public by the media.

From April through July 2007, Public Affairs staff worked in a steadfast manner to contact local media the moment news came to CPSC's attention about an ATV-related death. Staff worked with newspaper, radio and television reporters and producers to secure either a news story about ATV safety or the airing of CPSC's TV and radio public service announcements. CPSC staff successfully secured airings of the radio and TV PSAs on more than 130 different radio and TV stations, in cities ranging from Huntington, WV to Bakersfield, CA to Cheyenne, WY to Madison, WI.

In addition to making proactive calls to the media as part of the Rapid Response program, Public Affairs was responsive to national and local press requests seeking interviews related to the agency's rulemaking, training programs, proposed legislation at the state and federal level, and statistical trends. For example, CPSC garnered substantial national media attention to the issue of ATV safety by tracking deaths during the Memorial Day Weekend (Associated Press wire story) and Labor Day Weekend (Associated Press Radio report).

CPSC staff also added new data, press clips, downloadable materials, and a "What To Know Before You Go" page to ATVSafety.gov. Through the Rapid Response program, CPSC staff tracked a measurable increase in visitors and hits to the site.

The agency's partnership with the National 4-H Council grew stronger in 2007 with our participation in an outreach and education program for state 4-H ATV safety program directors. Relationships with the West Virginia state ATV safety coordinator, the University of Arkansas for Medical Sciences/Arkansas Children's Hospital, Safe Kids Worldwide, and the Specialty Vehicle Institute of America were furthered this year through regular information sharing.

Reversing the Trend Line

In the 2008 Operating Plan, CPSC staff plans to continue information and education activities by working to prevent injuries and deaths to both children and adults in those states and communities most deeply impacted. The challenge to CPSC to find ways to reduce the total number of deaths and injuries is great as sanctioned ATV racing continues to be offered to children at ages younger than the recommended age for riding by CPSC and SVIA; the influence of stunt riding as promoted on the Internet has flourished[2]; and racing magazines and club promotional materials portray, at times, unsafe riding practices[3].

CPSC staff is committed to meeting this challenge by informing parents and youth riders that "before you hit the trails, take knowledge to the extreme." By following the agency's recommended safety measures, riders will decrease their likelihood of a fatal incident.

CPSC staff also remains committed to hosting, at a time when the Commission deems it to be appropriate, an "ATV Safety Summit," as proposed in the Notice of Proposed Rulemaking Briefing Package (Non-Regulatory section[4]).

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[2] http://www.youtube.com/results?search_query=ATV+and+stunt and http://atvstuntriders.tripod.com/id5.html

[3] Salem (OR) ATV riding club promotional brochure.

[4] All Terrain Vehicle Initiative, Part 2, Tab P, "Promoting ATV Safety – A Media & Information Outreach Plan of Action," www.cpsc.gov/library/foia/foia06/brief/ATVpt2.pdf.