

**LOG OF MEETING
DIRECTORATE FOR ENGINEERING SCIENCES**

SUBJECT: All-terrain vehicles (ATVs) – Meeting requested by the U.S. Consumer Product Safety Commission (CPSC) staff to demonstrate and discuss dynamic testing of ATVs.

DATE OF MEETING: October 17, 2017

PLACE OF MEETING: SEA Corporate Office, Columbus, OH

LOG ENTRY SOURCE: Caroleene Paul, ESME

COMMISSION ATTENDEES: See attached attendance list

NON-COMMISSION ATTENDEES: See attached attendance list

SUMMARY OF MEETING:

Representatives of the Specialty Vehicle Institute of America (SVIA) met with CPSC staff and SEA Limited (SEA) staff to discuss autonomous dynamic testing of all-terrain vehicles (ATVs).

Dr. Gary Heydinger of SEA presented an overview of tests that were conducted on model year 2014-2015 ATVs to measure the effects of the following on vehicle stability and handling:

- 2 riders on a single-rider ATV
- Single rider lean at 20 degrees and 40 degrees, nominally, into a turn
- ATV test operation on a groomed dirt surface
- Modifications to three different ATVs to change: center of gravity height and longitudinal location, front and rear stiffness, track width, steering geometry, and rear axle differential.

SEA staff demonstrated autonomous dynamic vehicle testing on a groomed dirt surface and answered questions on instrumentation and test methodology.

CPSC staff emphasized that this is exploratory testing and test reports with all results will be published within the next three months. SVIA agreed to meet again to discuss the test results after everyone has had a chance to review the reports.

CPSC staff informed SVIA that the spreadsheet summarizing fatal ATV IDIs for the past ten years is being assembled and will be submitted to SVIA as soon as it is completed. This information can be discussed at the next meeting as well.

Future work on developing a roll over simulator using information from autonomous rollovers of ATVs was also discussed.

The meeting agenda and handouts are attached.

MEETING ATTENDANCE RECORD
 SVIA/ CPSC Staff – October 17, 2017

COMMISSION ATTENDEES:

Name		Phone	Email
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NON-COMMISSION ATTENDEES:

Name		Organization	Phone	Email
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**CPSC Public Meeting on ATV Evaluations
October 17, 2017
SEA, Ltd. – Columbus, Ohio**

Agenda

10:30 AM	Welcome and Introductions	Mark Kumagai CPSC
10:45 AM	Presentation on 2017 Active Rider Study (with Comments on 2017 2-Rider ATV Study)	Gary Heydinger SEA
11:10 AM	Presentation on 2017 Groomed Dirt Study	Gary Heydinger SEA
11:35 AM	Presentation on 2017 ATV Modification Study	Gary Heydinger SEA
12:00 PM	Lunch	
1:00 PM	Demonstrations of Dynamic Testing on Dirt Surface	Gary Heydinger & SEA Staff
1:30 PM	Discussion of Future Work (Including Joint Work with SVIA)	
2:00 PM	Optional Tour of SEA Facility	

Listing of ATVs with Curb Weight and Transmission Types
(Handout from October 17, 2017 CPSC-SVIA Meeting at SEA)

Vehicle Letter	Curb Weight (lb)	Solid Rear Axle	Transmission Type
A	523.9	Solid	Automatic
B	432.8	Solid	Manual
C	650.8	No	Automatic
D	714.0	No	Automatic
E	734.1	No	Automatic
F	526.2	Solid	Automatic
G	694.0	No	Automatic
H	395.5	Solid	Manual
I	408.4	Solid	Manual
J	649.8	No	Automatic
K	832.0	No	Automatic
L	716.4	No	Automatic

	Tested in 2015		Tested in 2016		Tested in 2017		
Study	Human Driver Tests		Autonomous Tests				Number of Test Conditions per Vehicle
	Vehicle Characteristics Study ¹	Vehicle Characteristics Study ¹	Driver Active Study ² DPI	2-Rider Study ³	Groomed Dirt Study ⁴	Vehicle Modification Study ⁴	
Loading Conditions	DPI Upright Driver	GVW Upright Driver	DPI 0°, 20° & 40° Driver Leans	2-Rider 0° Driver Lean	DPI 0° Driver Lean	DPI 0° Driver Lean	
Vehicle A	1	1	3	1	1		7
Vehicle B	1		3	1	1		6
Vehicle C	1	1	3	1	1		7
Vehicle D	1	1	3	1	1		7
Vehicle E	1	1	3	1	1		7
Vehicle F	1	1	3	1	1	3	10
Vehicle G	1	1	3	1	1	3	10
Vehicle H	1		3	1	1		6
Vehicle I	1		3	1	1		6
Vehicle J	1	1	3	1	1		7
Vehicle K	1	1	3	1	1	4	11
Vehicle L	1	1	3	1	1		7
Total Number of Test Conditions							91

¹ Vehicle Characteristics Measurements of All-Terrain Vehicles – Results from Tests on Twelve 2014-2015 Model Year Vehicles, HHS Contract HHSP2332014000301, SEA, Ltd. Report to CPSC, November 2016. https://www.cpsc.gov/3fs-public/SEA_Report_to_CPSC_Vehicle_Characteristics_Measurements_of_All_Terrain_Vehicles.pdf

² Effects on ATV Vehicle Characteristics of Driver Active Weight Shift – Results from Tests on Twelve 2014-2015 Model Year Vehicles, HHS Contract HHSP2332014000301, SEA, Ltd. Report to CPSC, In Review.

³ Effects on Vehicle Characteristics of Two Persons Riding ATVs – Results from Tests on Twelve 2014-2015 Model Year Vehicles, HHS Contract HHSP2332014000301, SEA, Ltd. Report to CPSC, September 2017. https://www.cpsc.gov/3fs-public/SEA-Final-Report-to-CPSC-2-Rider-ATV-Study.pdf?V0ixJO3o_kbtmsmIBeKUIInRAF.x6hVocs5

⁴ Test Reports in Progress

ATV Modification Study
Summary of Modifications Made to Each Vehicle
(Handout from October 17, 2017 CPSC-SVIA Meeting at SEA)

All tests were conducted on asphalt and in the representative 215 lb driver only loading condition with 0° driver lean angle.

All Baseline tests were conducted as part of the previous Rider Active Study.¹ The Baseline tests, and all modification tests on Vehicle F and Vehicle G were conducted in the CCW and Left turn directions.

All modification tests on Vehicle K were conducted in both the CCW and CW directions, and in both the Left and Right turn directions.

Vehicle F Modifications:

- Mod 1: Added 2” Wheel Spacers to Increase Track Width
- Mod 2: Lowered “Driver Ballast” to Reduce Vehicle CG Height
- Mod 3: Moved “Driver Ballast” and Other Ballast Forward to Move Vehicle CG Forward (to Match CG Longitudinal Position Used for Tests With Human Driver)

Vehicle G Modifications:

- Mod 1: Replaced Front Springs to Increase Front (Roll) Stiffness
- Mod 2: Replaced Front Springs to Increase Front (Roll) Stiffness, and Disconnected Rear Anti-roll Bar to Decrease Rear Roll Stiffness
- Mod 3: Replaced Front Springs to Increase Front (Roll) Stiffness, Disconnected Rear Anti-roll Bar to Decrease Rear Roll Stiffness, and Modified Steering Geometry to Reduce Roll Oversteer

Vehicle K Modifications:

All modification testing on Vehicle K conducted with vehicle equipped with selectable “Locked” or “Open” rear differential

- Mod 1: Tested on **Asphalt** with **Locked** Differential
- Mod 2: Tested on **Asphalt** with **Open** Differential
- Mod 3: Tested on **Groomed Dirt** with **Locked** Differential
- Mod 4: Tested on **Groomed Dirt** with **Open** Differential

¹ *Effects on ATV Vehicle Characteristics of Driver Active Weight Shift – Results from Tests on Twelve 2014-2015 Model Year Vehicles*, HHS Contract HHSP233201400030I, SEA, Ltd. Report to CPSC, In Review.