LOG OF MEETING
DIRECTORATE FOR ENGINEERING SCIENCES

SUBJECT: Recreational Off-Highway Vehicles (ROVs) – Meeting requested by the Outdoor Power Equipment Institute (OPEI) to discuss progress on the development of draft standard ANSI/OPEI B71.9 - 200X.

DATE OF MEETING: November 2, 2010

PLACE OF MEETING: U.S. Consumer Product Safety Commission, Bethesda, MD

LOG ENTRY SOURCE: Caroleene Paul, ESME CP

COMMISSION ATTENDEES: See attached attendance list

NON-COMMISSION ATTENDEES: See attached attendance list

SUMMARY OF MEETING:

Representatives of the Outdoor Power Equipment Institute (OPEI) ANSI B71.9 Committee met with CPSC staff to to discuss changes that OPEI is planning to make to its Multi-Purpose Off-Highway Utility Vehicles draft standard, ANSI/OPEI B71.9-201X.

CPSC staff opened the meeting by setting the following ground rules:

- OPEI requested this meeting with CPSC staff so although the meeting is public, discussions are limited to OPEI representatives and CPSC staff/representatives.
- The opinions or views expressed by CPSC staff have not been reviewed or approved by the Commission and may not reflect the views of the Commission.
- The discussions during the meeting will be treated as comments to the ongoing rulemaking and will become part of the public record.

OPEI representatives presented an overview of the proposed changes to their draft standard since March 2010 (see attached presentation). The changes include: addition of dynamic stability test, addition of occupant side retention requirement, addition of occupant restraint reminder requirement, addition of static stability coefficient (Kst) requirement, addition of occupant load configuration to tilt table test, increase in tilt table angle requirement, and additions to required warning messages.

Dynamic Stability Test

The proposed dynamic test is a J-Turn type test on pavement with the vehicle loaded to simulate a driver and passenger. OPEI representatives proposed to specify the following:

- outriggers with minimum effect on vehicle dynamics
- 20 mph trigger speed
- drop throttle method to reach trigger speed
- 180 deg hand wheel steer input at 500-600 deg/sec
- pass/fail criteria of no two wheel lift above 2 inches during the maneuver

OPEI representatives discussed the testing and rationale that lead to the specified criteria for the dynamic test. CPSC staff asked OPEI to explain why/how dynamic J-Turn tests provide information about the vehicle's steering gradient. OPEI representatives replied that vehicles with high oversteer would experience a high lateral acceleration gain that would result in earlier tipover of the vehicle; thus, the pass/fail criteria for the J-Turn test will not allow vehicles with severe oversteer to pass.

Occupant Protection

The proposed requirements for occupant protection focus on occupant side retention, minimum 3-point seat belts for all occupant seating locations, seat belt reminders, and helmet recommendation. Side retention devices include doors, nets, hip/torso/shoulder bars, and/or other physical barriers or design features. The seat belt reminder proposal specifies that a continuous or flashing warning (to fasten seat belts) be displayed when the vehicle is turned on.

CPSC staff questioned and commented on the following:

- Nets – CPC staff asked how often consumers actually use nets. If the netting becomes a nuisance, especially during frequent ingress and egress, consumers will remove the netting entirely.
- Definition of "retain" – CPSC staff questioned how OPEI defines "retain" in terms of occupant protection requirements. OPEI responded that the definition has not been finalized.
- CPSC staff encouraged OPEI to pursue passive restraint designs such as shoulder bars.
- Seat Belt Reminders – CPSC staff questioned if the seat belt reminders would go off once an occupant fastens the seat belts. OPEI responded that the proposal allows but does not require that level of sophistication. The seat belt reminder can be designed to simply remain on for a certain amount of time after the vehicle is started regardless of whether or not the occupant has fastened the seat belt. OPEI discussed at length the difficulties with seat belt latch sensors.
- CPSC staff asked if OPEI's proposals, especially the seat belt reminder, were really the best that could be done. Seat belt use is critical for occupant safety during a rollover event and the incident data consistently show that seat belts are not being worn. Addressing this issue may be difficult, but it also provides the most return on safety.

Static Stability Testing

OPEI representatives proposed to make the following changes to the draft voluntary standard's stability requirement section:

- Add a lateral stability coefficient (Kst) requirement of at least 1.0 for an unoccupied vehicle
- Increase the **lateral** tilt table angle requirements from 20 deg to 24 deg in the gross vehicle load configuration (vehicle with full occupants and cargo load).
- Increase the **longitudinal** tilt table angle requirement from 25 deg to 28 deg in the gross vehicle load configuration.
- Add a **lateral** tilt table angle requirement of 30 deg in a vehicle configured with two occupants.

CPSC staff commented that it's preferable to use a Kst for a vehicle with two occupants as there are no incidents with an unoccupied vehicle. OPEI representatives responded that it is too difficult to measure the center of gravity of a vehicle with two test dummies.

Schedule

OPEI representatives reviewed the schedule to finalize the draft standard, to send it out for 2nd canvass, and to continue to review the available incident data. CPSC staff suggested that OPEI continue with their schedule and not wait for any action from CPSC.

MEETING ATTENDANCE RECORD
ROHVA / CPSC Staff – December 9, 2009

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ANSI / OPEI B71.9 Committee Presentation to CPSC

2 November 2010

ANSI / OPEI B71.9 (Draft) Multipurpose Off-Highway Utility Vehicles (MOHUV)

- Outdoor Power Equipment Institute (OPEI) is an ANSI accredited standards development organization.
- Representation from the following companies:
  - Ariens - Bush Hog
  - Club Car - Husqvarna
  - Honda - John Deere
  - Kawasaki - Kubota
  - MTD Products - Textron
  - Toro - Yamaha

Current Draft Definition of MOHUV

- A MOHUV has features for utility use and has the following characteristics:
  - Intended to transport persons and/or cargo, with a top speed in excess of 25 MPH (40.2 km/h) but not more than 50 MPH (80.4 km/h)
  - Designated seating for two or more occupants
  - With a non-straddle seat
  - 80 in (2030 mm) or less in overall width
  - Designed to travel on four or more wheels
  - Using a steering wheel for steering control
  - With a Gross Vehicle Weight Rating of no more than 4000 lbs (1814 kg)
  - 350 lbs minimum cargo capacity

Usage and Design Trade Offs

Utility Use

Recreation Use

Usage Trade Off

Design Trade Off

Stability

Mobility

Changes to Draft Standard Since March

- Added Dynamic Stability Test
- Added Occupant Side Retention requirement
- Added Occupant Restraint Reminder requirement
- Added Static Stability Coefficient (Kst) requirement
- Added an occupied load configuration to tilt table test
- Increased tilt table angles for existing load configurations
- Additions to required warning messages

Dynamic Stability Test Procedure

- Test driver and passenger weight equivalent
- Center mounted, symmetric outriggers
- Concrete or asphalt test surface
  - Off road vehicles, but is a repeatable surface
- Drop throttle
- 20 mph test speed
- 180 degree hand wheel steer (HWS) input
- HWS angle input rate 500-600 deg/sec
- Pass criteria: No two wheel lift above 2 inches.

Dynamic Stability Test Procedure Rationale

- IDI analysis –
  - Transient events.
  - In cases where speed was reported, the majority were less than 20 mph.
  - Load configuration is representative
- Certain elements of the procedure (e.g., lifting of throttle) representative of an avoidance maneuver.
- 180 degree HWS angle is much more extreme than a typical scenario.
- Test surface is a high coefficient of friction and repeatable surface.
- Accounts for multiple factors (e.g., steering gradient, stability, steering ratio, suspension response, etc.).

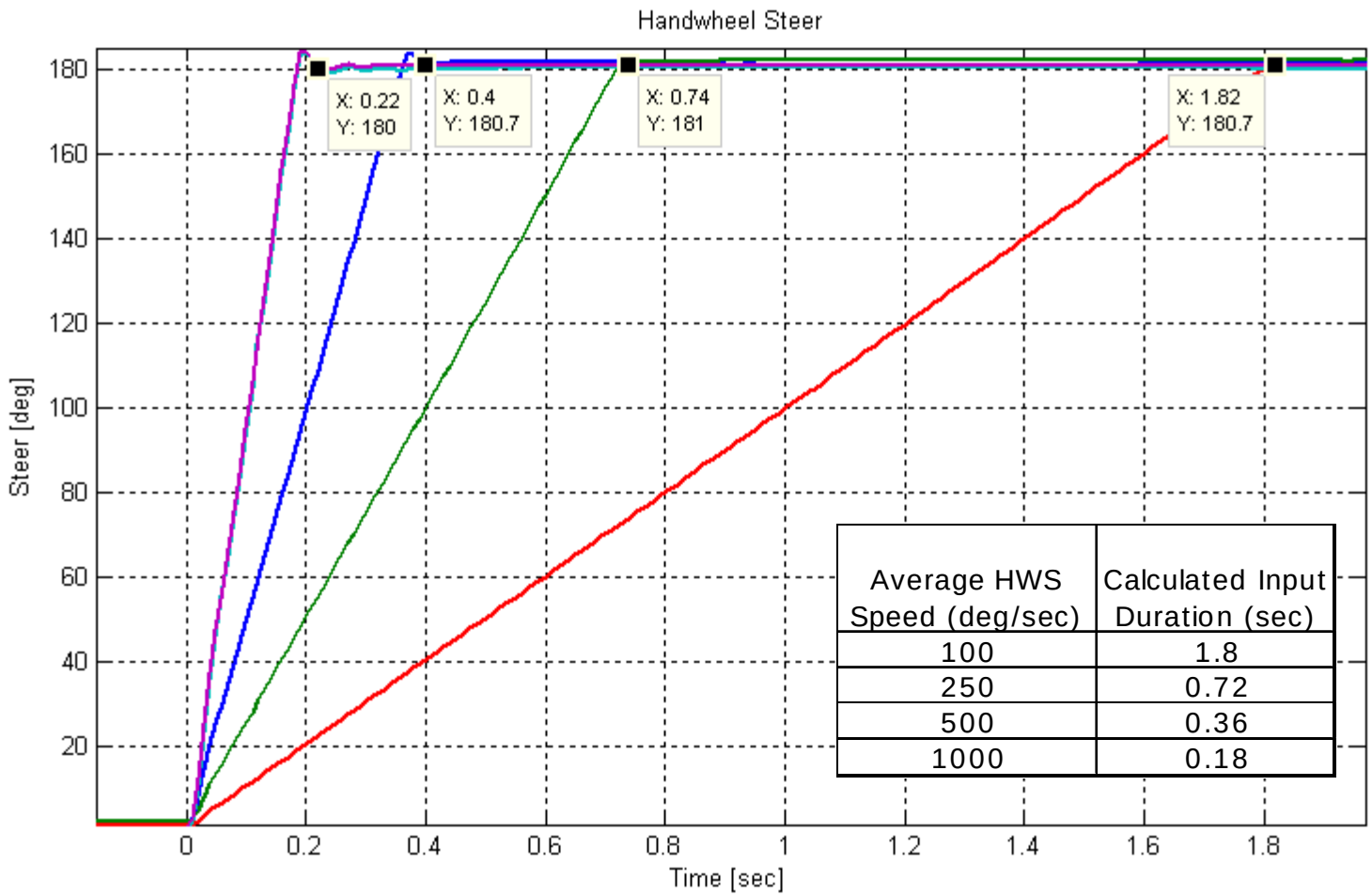
Dynamic Stability Test
Additional Supportive Comments

- Measureable inputs
  - Ground Speed, Hand Wheel Steer Angle and Input Speed
- Verifiable test acceptance criteria
  - Two wheel lift can be verified visually

Other Variables Considered

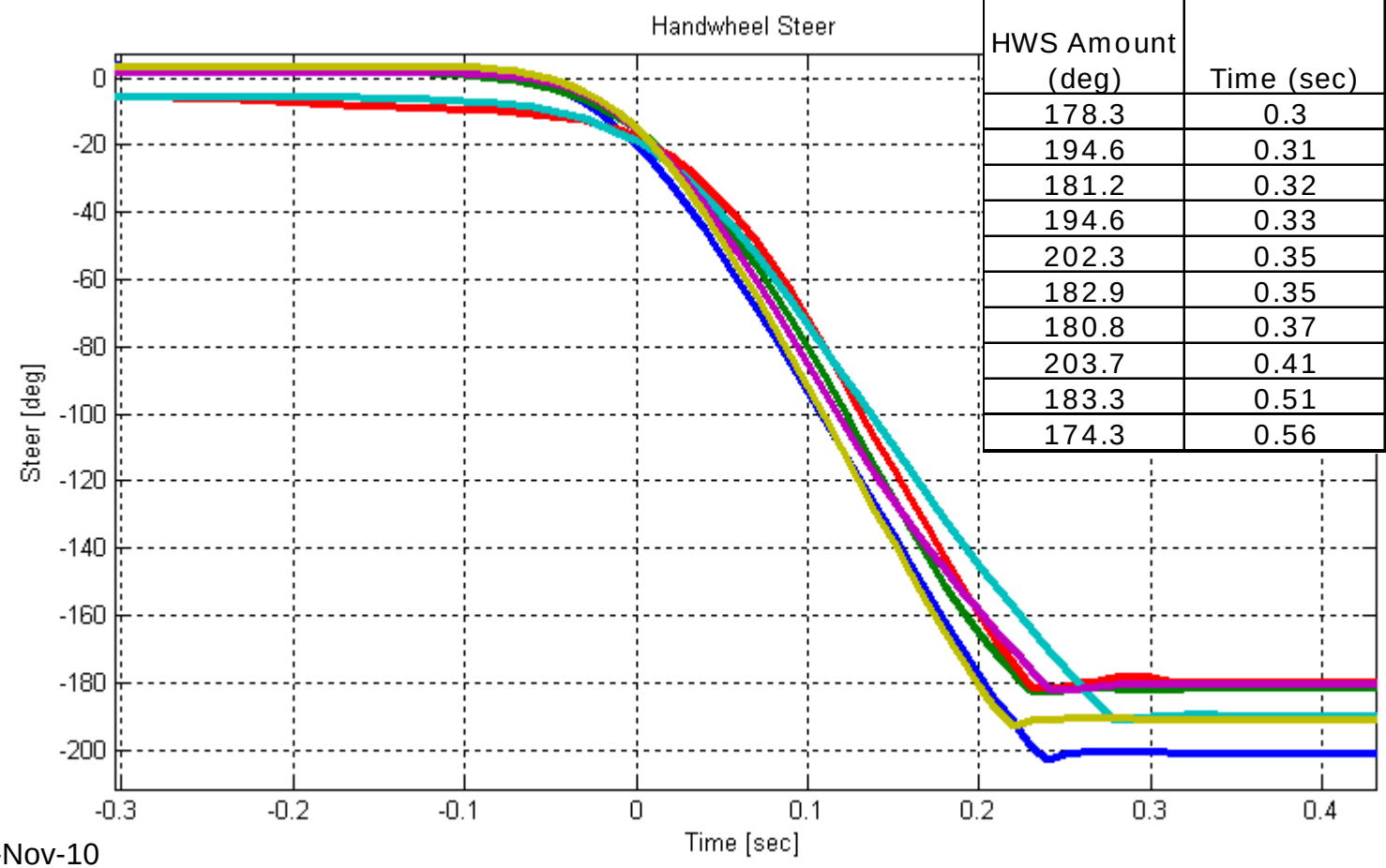
- Two wheel lift vs. lateral g
- Constant throttle vs. drop throttle
- Hand Wheel Steer angle rate
- Coasting duration
- Outrigger touchdown vs. two wheel lift
- Outrigger configuration
- Wet vs. dry asphalt
- One occupant vs. two occupants vs. GVWR
- Left vs. right hand turns

HWS Input Rates and Durations



Average HWS Speed (deg/sec)	Calculated Input Duration (sec)
100	1.8
250	0.72
500	0.36
1000	0.18

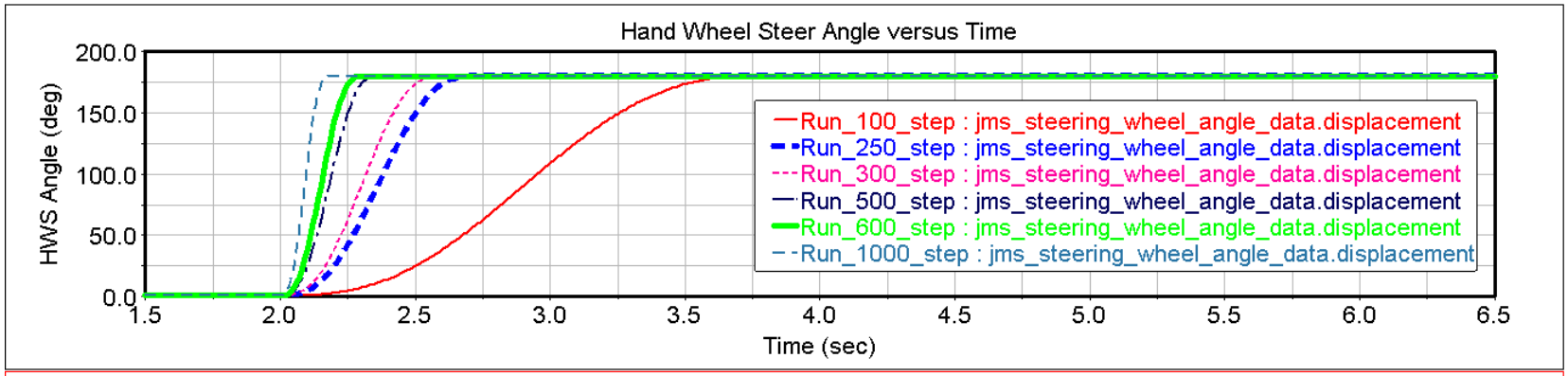
HWS Input Rates and Durations Manual Input

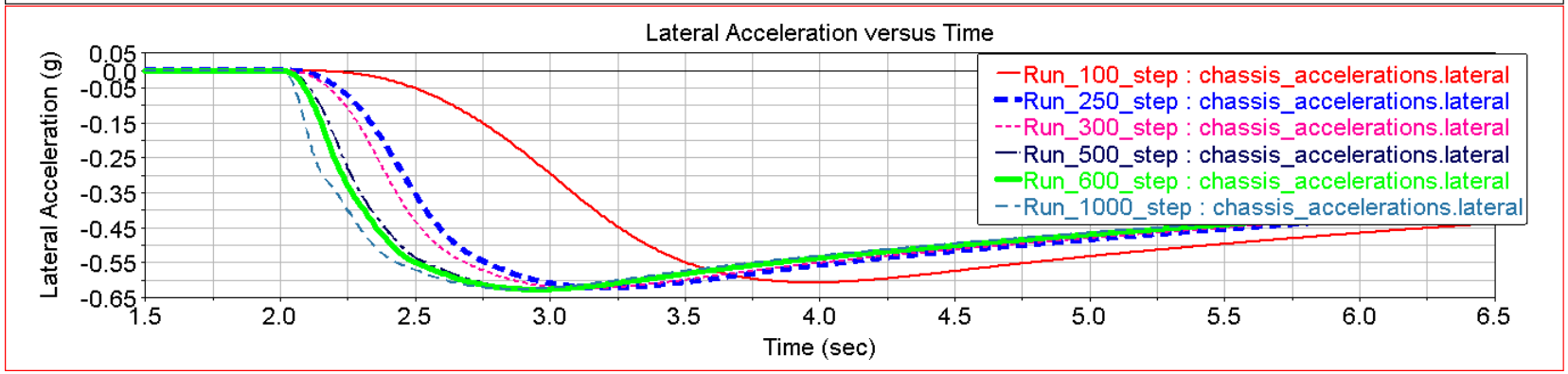


HWS Amount (deg)	Time (sec)	Average Rate (deg/sec)
178.3	0.3	594
194.6	0.31	628
181.2	0.32	566
194.6	0.33	590
202.3	0.35	578
182.9	0.35	523
180.8	0.37	489
203.7	0.41	497
183.3	0.51	359
174.3	0.56	311

Coast & Turn HWS Input Speed Sensitivity

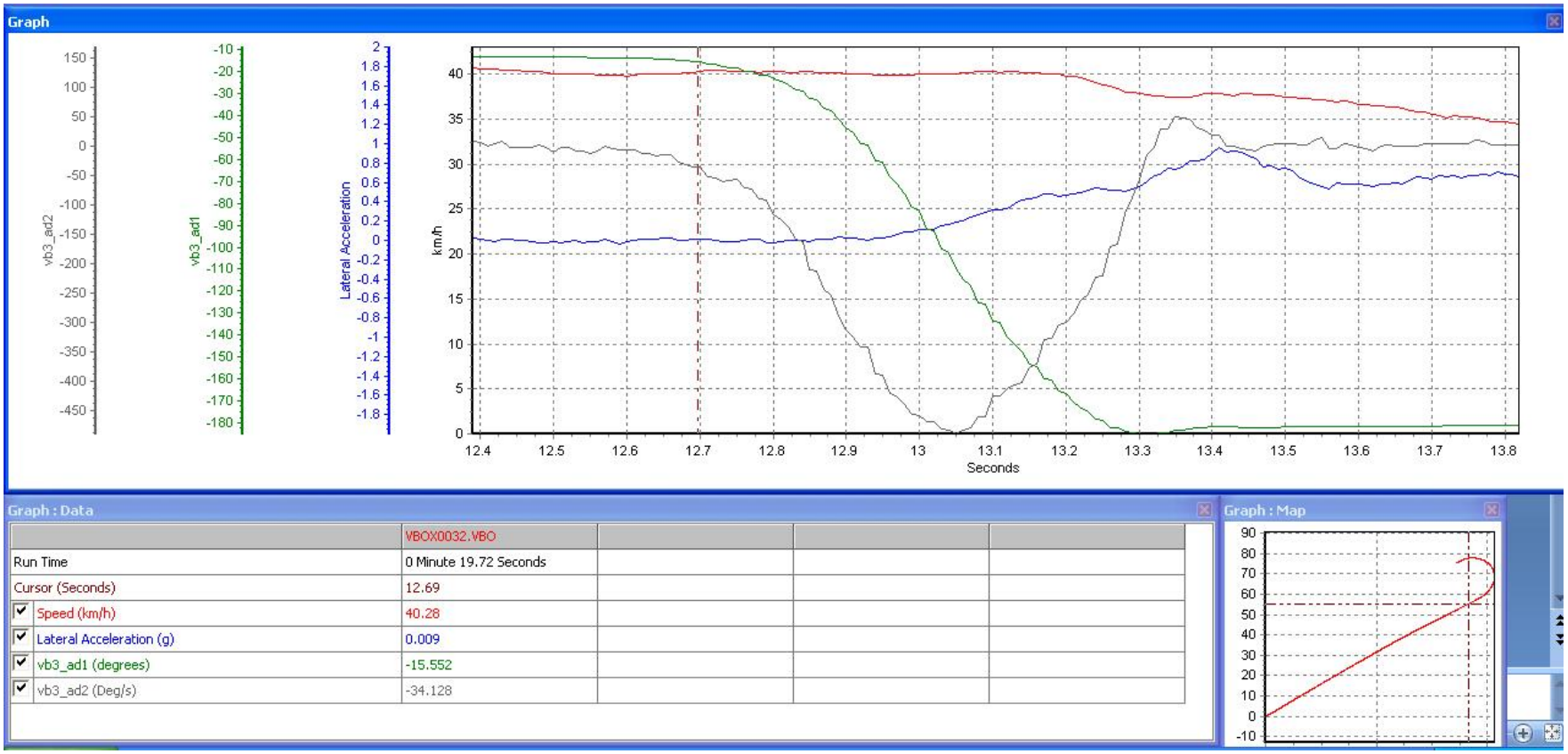
180 Deg HWS - 100, 250, 300, 500, 600, 1000Deg/Sec Input Speed Simulation Results





Hand wheel steer average input speeds of 300 to 600 deg/s appear to produce good test results while remaining feasible for manual input.

Drop & Turn Test Results



	VBOX0032.VBO			
Run Time	0 Minute 19.72 Seconds			
Cursor (Seconds)	12.69			
☑ Speed (km/h)	40.28			
☑ Lateral Acceleration (g)	0.009			
☑ vb3_ad1 (degrees)	-15.552			
☑ vb3_ad2 (Deg/s)	-34.128			

Testing Variables

Direction	Run #	HWS Input Rate (deg/sec)	Test Type	Lateral Acceleration Delta (g)	Input Velocity Delta (mph)	Comments
R	108	500	D&T	Baseline	Baseline	2WL
R	115	500	C&T - 2	-0.05	+1	2WL
R	116	500	C&T - 5	-0.04	+1	2WL
R	117	500	C&T - 11	-0.02	+1	2WL
R	118	250	C&T - 2	+0.1	+1	2WL
R	119	100	C&T - 2	-0.11	+1	Rear Wheel Lift
R	120	1000	C&T - 2	0	+1	2WL
R	121	1000	C&T - 2	-0.01	0	2WL - Slight
R	122	500	C&T - 2	-0.01	0	Rear Wheel Lift
L	135	500	D&T	Baseline	Baseline	2WL
L	137	500	C&T - 2	-0.02	+1	2WL
L	138	500	C&T - 5	-0.01	+1	2WL
L	139	500	C&T - 11	+0.01	+1	2WL
L	140	250	C&T - 2	0	+1	2WL - Slight
L	141	100	C&T - 2	-0.05	+1	Rear Wheel Lift
L	142	1000	C&T - 2	0	+1	2WL
L	143	1000	C&T - 2	-0.01	0	2WL - No OR Contact

- D&T and C&T within one mph
- Lateral acceleration not a robust criteria for pass/fail

Questions/Comments on Dynamic Test?

Occupant Protective System

- Occupant Protective Structure
- Occupant Side Retention
- Seat Belts
  - 3 pt minimum for all occupant seating positions
- Seat Belt Reminder
- Handholds
- Helmet Recommendation

Usage and Design Trade Offs

Utility Use

Recreation Use

Usage Trade Off

Design Trade Off

Stability

Mobility

Occupant Side Retention

- MOHUV's shall be equipped with Occupant Side Retention Device(s).
  - Occupant Side Retention Devices are physical barriers or design features intended to help retain a properly belted occupant's head, upper torso, or limbs in the event of a tip-over generally 90 degrees to the side.
  - Doors, nets, and hip, torso, or shoulder pads or bars, or other physical barriers or design features may be used to comply with these requirements.

Seat Belt Reminder Light

- The vehicle shall be equipped with a warning system that activates a continuous or flashing warning light visible to the operator, displaying the identifying symbol for the seat belt as defined by Figure X (as shown below), or the words “Fasten Seat Belts” or “Fasten Belts”, when the vehicle’s ignition switch is moved to the “on” position or to the “start” position.

Stability Testing

- Stability Coefficient
  - Kst Requirement – 1.0 minimum at Curb Weight Configuration
- Tilt Table Testing
  - Lateral Stability 24 degrees at Gross Vehicle Weight Rating Configuration.
  - Lateral Stability 30 degrees at Curb Weight Plus A Test Operator and One Passenger Configuration.
  - Longitudinal Stability 28 degrees at Gross Vehicle Weight Rating Configuration.
- Dynamic Stability Test

Required Warning Messages

- Key content in owner's/operator's manual and/or on vehicle:
  - A warning regarding the hazards of not wearing a seat belt.
  - A warning that the vehicle should not be operated under the influence of drugs or alcohol.
  - A warning that individuals not ride in the cargo bed.
  - The minimum operator age of 16 unless the operator has obtained a state issued motor vehicle driver's/operator's license
  - That the vehicle is for off-highway use only
  - A warning that the vehicle is designed for a maximum number of occupants and that occupants should only ride in designated seating positions with one person in each seating position.

Required Warning Messages

- Key content in owner's/operator's manual and/or on vehicle (continued):
  - The importance of using recommended protective apparel including helmets and eye protection
  - That improper use, making abrupt maneuvers and operating the vehicle on steep slopes or at speeds too fast for the conditions raises the risk of rollover.
  - How driving on paved surfaces, in the different drive modes (2wd, 4wd, etc.), and carrying people and cargo affect vehicle handling.

Schedule

- Finalize draft standard
  - Including response to comments from 1st canvass
- Send out for 2nd canvass
  - CPSC will be on canvass list
- Continue to review available data
  - CPSC
  - Other sources

Questions