

**LOG OF MEETING
DIRECTORATE FOR ENGINEERING SCIENCES**

SUBJECT: Recreational Off-Highway Vehicles (ROVs) – ROHVA Voluntary Standards Meeting

DATE OF MEETING: October 5, 2015

PLACE OF MEETING: CPSC Hearing Room, Bethesda Towers, Bethesda, MD.

LOG ENTRY SOURCE: Caroleene Paul, ESME

COMMISSION ATTENDEES: See attached attendance list

NON-COMMISSION ATTENDEES: See attached attendance list

SUMMARY OF MEETING:

ROHVA representatives summarized the areas of concern expressed by CPSC staff at the October 23, 2014 public meeting and the proposed requirements for the next revision of ANSI/ROHVA 1 that address those concerns. In summary:

- Lateral stability is addressed by:
 - a tilt table test minimum requirement of 33 degrees
 - hang tag that displays the vehicle's tilt table limit
 - 30 mph J-turn test that prohibits two-wheel at 110 degrees of steer angle
- Vehicle handling is addressed by:
 - Constant steer angle test and performance requirement based on computation of the yaw rate ratio
- Occupant protection is addressed by:
 - Seat belt speed limiter reminder on driver's seat belt that limits speed to 15 mph if seat belt is not buckled
 - Side retention barriers that must meet a probe test

The constant steer angle test and yaw rate ratio calculation was developed by Polaris Industries, and Polaris representatives presented their analysis of yaw rate ratio data provided by CPSC staff (presentation attached). The following topics were discussed:

- Polaris agrees with CPSC staff's suggested method of slope calculation.
- Based on analysis of vehicle path diameter and measured yaw rate ratios, Polaris believes a yaw rate ratio limit of 4.5 in each turn direction will ensure that vehicles do not exhibit divergent instability.
- Polaris recognizes that some vehicles may require adjustments to meet the proposed yaw rate ratio requirement.
- Variability in test measurements will require manufacturers to design to a value below 4.5 to ensure that vehicles pass the proposed requirement.

CPSC staff thanked ROHVA and Polaris for the obvious effort in developing requirements to address staff's concerns. Staff also urged ROHVA and OPEI to ballot their respective proposals in order for staff to provide comments.

MEETING ATTENDANCE RECORD
ROHVA – October 5, 2015

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MEETING ATTENDANCE RECORD

ROHVA – October 5, 2015

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Yaw Velocity Test Pass/Fail

October 5, 2015

October 23, 2014 Meeting

Predictability and path-following is critical

Vast majority of ROV rollovers are tripped

Oversteer in itself is not a hazardous condition

Risk occurs when oversteer leads to divergent instability

Identified Possible Path Forward Regarding Handling

Polaris' Development Objective

Develop a test and pass/fail that limits the amount of permissible oversteer

Benchmark off of vehicles that are proven and well-received by customers with strong safety records

Prevent vehicles that could exhibit Divergent Instability off-road and thereby lead to tripped rollover

Create New Handling Test To Address Real Concern

Divergent Instability?

No definition off-road

Used ride and handling experts to evaluate stock and modified vehicles off-road

Forced to evaluate on-road behavior

Focused on spin-out on test pad to develop pass/fail

Distinguish between oversteer vehicle performance

Identified Slope Ratio As Metric

Demanding and Conservative Test Protocol

Fixed steer

Ignores minor steering adjustments that routinely occur off-road

Up to 0.5g

Higher A_y than experienced off-road prior to slide (per Polaris/SEA testing, slide occurs by 0.3g)

On-road surface

Off-road tires degrade traction, increase propensity to spin and increase variability

Polaris' Proposed Updated Pass/Fail

Updates from June 4, 2015 Draft ANSI/OPEI Standard

Adopt CPSC staff's proposed methodology changes

Subject to confirming correct execution of changed methodology

Requested CPSC/SEA data for Polaris vehicles in order to check calculations, but data has not been provided

Use absolute values to calculate slopes

Evaluate CW and CCW turns independently

Pass/Fail

No TWL w/in 0.5g

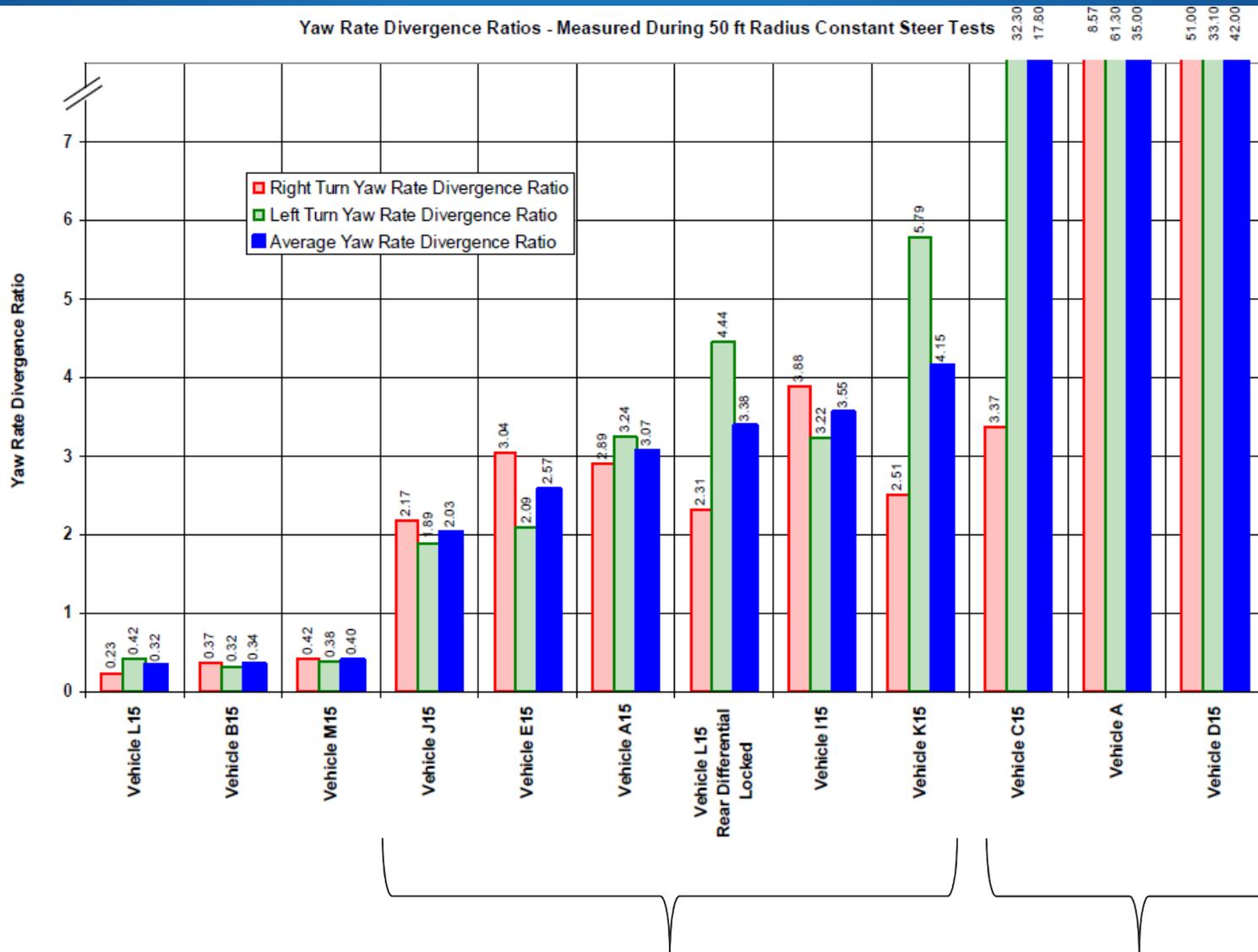
Slope ratio (0.1-0.2g vs. 0.4-0.5g) at/below 4.5

CPSC's methodology results in higher ratios and accounts for vertical/negative slopes

Evaluating turns independently requires higher value due to asymmetry

Incorporates CPSC Staff Feedback

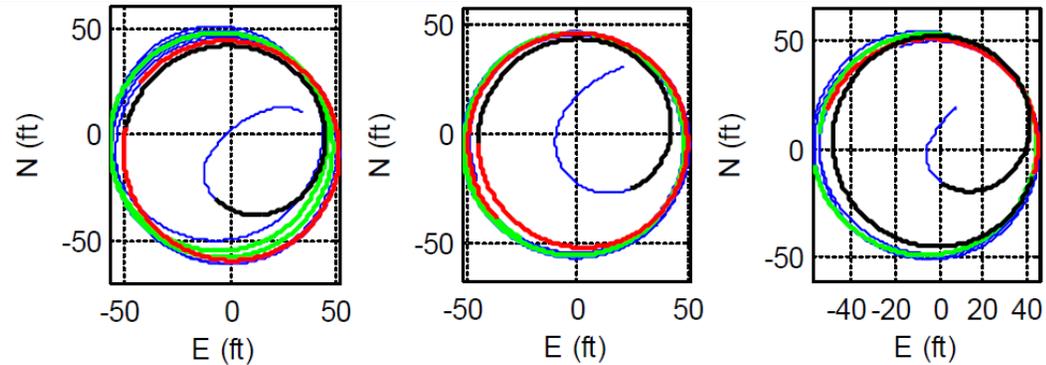
Distinctions Revealed in Test Populations



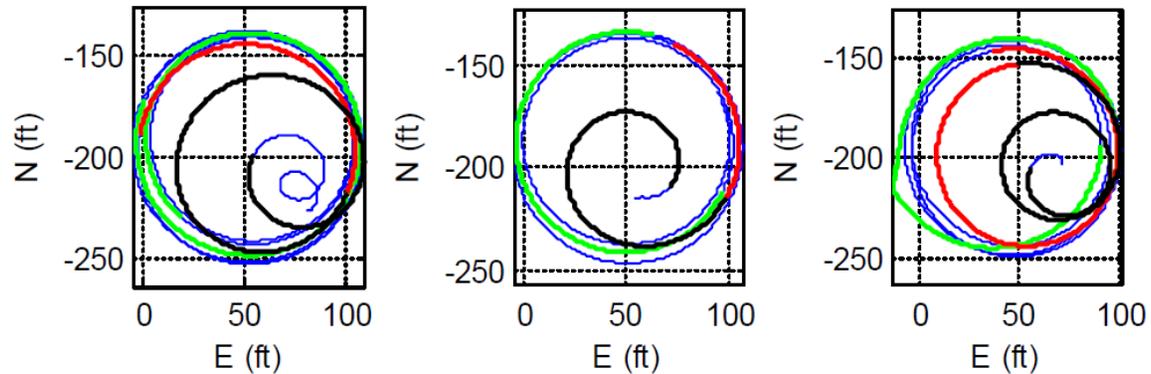
Two Types of Oversteer Vehicle Performance

Comparable Path-Following Within Test Envelope

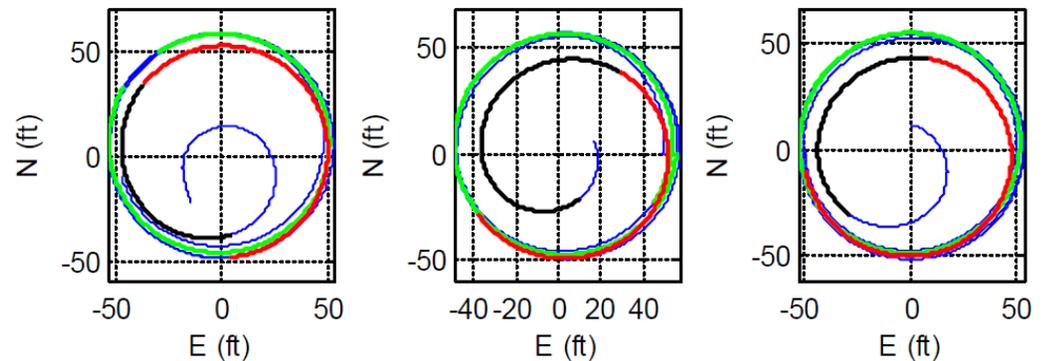
Vehicle J15
CW 2.17



Vehicle I15
CW 3.88



Vehicle K15
CCW 5.79



Vehicles with Ratios 2.0-6.0 Have Predictable Handling/No Spin-Out

Rationale for 4.5 Pass/Fail

Specifically Addresses October 23, 2014 concern:
Limit extent of oversteer in an effort to avoid divergent instability off-road
and reduce tripped rollovers

Precludes vehicles that exhibit significant yaw velocity gain (as measured by slope ratios above 15.0) within 0.5g

Permits most oversteer vehicles in the 2.0-6.0 slope ratio range, which all exhibit predictability on-road within 0.5g

Precludes even predictable on-road oversteer (for vehicles that must be adjusted to pass 110 deg J-Turn)

Requires adjustment of vehicles close to pass/fail due to reproducibility and manufacturing margin

Results in repeatability of pass/fail outcome

Conservative Pass/Fail Requiring Adjustment of Well-Performing Vehicles

Stability and Handling Metrics

Comprehensive and Interrelated Tests

Yaw Velocity with 4.5 ratio pass/fail

30 MPH J-Turn at 110 deg

Op+Pass TTA at 33 deg

Significant Additions to Voluntary Standard