



CPSC Staff's Statement<sup>1</sup> on EurekaFacts,  
"ROV Hangtag Evaluation: Cognitive Interview and Focus Group  
Testing of ROV Hangtags"  
September 2015

The report titled, "ROV Hangtag Evaluation: Cognitive Interview and Focus Group Testing," presents the findings of research conducted by EurekaFacts, under Contract CPSC-Q-15-0005. The CPSC's notice of proposed rulemaking ("NPR") proposed a hangtag for recreational off-highway vehicles ("ROVs") at the point-of-purchase, providing consumers with ROV rollover information. The ROV rollover information being provided in the hangtag is the result of technical performance tests. The contract evaluated the initial design from the NPR, using consumer feedback, and developed recommendations for a hangtag to present the technical information in a way more easily understood by consumers.

EurekaFacts conducted two rounds for the study. The first round consisted of 10 cognitive interviews and two focus groups asking participants to evaluate the initial hangtag. EurekaFacts developed six hangtag designs based on the feedback from the first round. The second round consisted of three focus group sessions to evaluate the six hangtag designs to develop a final recommendation.

Based on consumer feedback obtained during the testing, EurekaFacts developed a final recommendation for a hang tag. The recommendations include the following requirements: that the hangtag be a 5-inch x 7-inch vertical design with an entirely yellow background; include a pictorial of a tipping vehicle; and use the heading, "Rollover Guide." EurekaFacts recommended that the engineering test data be presented in simple, easy-to-understand language, using terms understood by consumers. For example, EurekaFacts suggested using a 10-point scale positively related to the heading; in other words, that lower numbers on the scale are "less," and higher numbers are "more," as related to the heading title. In addition, the contractor recommended that supplemental information be made available, to include information on the scale range and rollover rating, an explanation of how rollover ratings are determined, and information on resources that provide additional information.

The attached report describes the methodology, interview process, and the findings from the interviews and focus group, as well as recommendations for a final hangtag design.

---

<sup>1</sup> This statement was prepared by the CPSC staff, and the attached report was produced by EurekaFacts for CPSC staff. The statement and report have not been reviewed or approved by, and do not necessarily represent the views of, the Commission.

# **Evaluation of Recreational Off-Highway (ROV) Vehicle Hangtag: Cognitive Interview and Focus Group Testing**

---

Final Report  
August 31, 2015

Submitted to:  
Consumer Product Safety Commission

Submitted by:  
EurekaFacts, LLC

## Table of Contents

Executive Summary .....	1
1. Background .....	4
2. Study Design .....	5
2.1. Method .....	5
2.2. Study Population and Sample .....	6
2.3. Data Collection Procedure .....	8
2.4. Protocols .....	9
2.5. Limitations .....	10
3. Round 1 Evaluations .....	11
3.1. Results .....	11
3.2. Conclusions .....	17
3.3. Redesign Recommendations .....	19
3.4. Proposed Alternative Designs .....	22
4. Round 2 Evaluations .....	28
4.1. Results .....	28
4.2. Final Design Recommendations .....	35

# Executive Summary

## Methodology

EurekaFacts conducted two rounds of evaluation in an effort to test and redesign hangtags providing consumers with ROV rollover information at the point of purchase. The purpose of this study was to evaluate the effectiveness of the hangtag to communicate the stability of the ROV compared to other ROVs. The specific objectives of the evaluation were to assess the content, clarity, and believability of the hangtag message, while still presenting technical information.

The first round of evaluations included a combination of focus groups and cognitive interviews. EurekaFacts conducted a total of 10 cognitive interviews and two focus groups consisting of five participants per group. Participants were asked both individually and in group discussions what parts (if any) of the proposed hangtag they found confusing, and how the initial design could be improved. Participants were asked to evaluate the proposed hangtag, and to provide feedback and suggestions for its improvement. The evaluation of the hangtag design was conducted across the following dimensions: attention, comprehension, message credibility and relevance, and behavioral compliance. Based on participant's feedback and safety label design guidelines, EurekaFacts designed six alternative hangtag designs for further testing in the second round of evaluations.

During the second round of the ROV hangtag study, evaluation consisted of three focus group sessions. Six redesigned versions of the hangtag were tested across three focus groups, consisting of ten participants per group. Participants were asked to evaluate the hangtag design in the same five dimensions assessed during the first round of testing. Based on participants' reactions, feedback, preferences, as well as hangtag design standards, a proposed final version of the hangtag was designed.

In both rounds of the evaluation, the sample included the following groups: utility users - individuals who use ROVs for work (e.g. rural users, farmers), recreational users (e.g. outdoor sports enthusiasts), experienced ROV users, and potential new users.

## Round 1 Results

Round 1 focus groups included different types of ROV users. Group 1 consisted of recreational users (e.g. outdoor sports enthusiasts) and Group 2 included utility users (e.g. rural users, farmers). Despite the different usage type of participants in these two groups, the results show no considerable differences in the feedback regarding the tested ROV hangtag, and identified common issues in understanding the tested hangtag.

The following common themes were identified across all cognitive interviews and focus groups:

- **Most Noticeable Feature:** The participants reported that the title "Rollover Resistance" and the pictorial symbol used to depict a rollover were the most salient aspect of the hangtag. The heading panel of the hangtag seemed to be especially conspicuous, as it quickly captured participants' attention.
- **Scale/Graph Understanding:** A majority of the participants reported they found that the scale presented in the hangtag was the primary area of misunderstanding. Most participants were uncertain what, exactly, the scale was measuring. Furthermore, the terminology used in the textual portion of the hangtag was also reported as confusing.
- **Message Comprehension:** Most participants understood, at a high level, that the purpose of the hangtag was to warn about the inherent hazard of operating an ROV. When asked specifically, many participants stated that the message of the hangtag was to moderate one's speed in order to minimize the risk of

involvement in a rollover accident. A few participants identified the message as telling potential buyers to compare vehicles. Thus, the main message communicated by the hangtag was misunderstood.

Suggestions for improvement:

- Participants' suggestions for improvement were mostly focused on the alterations to the scale of the hangtag, and the text presented in the bottom portion of the hangtag.
- There was unanimous agreement among the participants that the scale needs to be modified in an effort to make it simpler and more understandable.
- A majority of the participants recommended that the technical text on the hangtag should be less complex and more understandable. Participants suggested using "layman's language" and replace the text with graphical representations whenever possible.

## **Round 2 Results**

Six alternative versions of the hangtag design were tested in the second round of evaluation. Focus groups participants reported preferences for the messaging, appearance, and design elements of the hangtag. The feedback and preferences that participants provided were consistent across different focus groups regardless of user type and level of experience with ROVs.

The following common themes were identified across all focus groups:

- Title Understanding:
  - A considerable portion of the participants reported that the term "Rollover Resistance" is confusing and needs to be revised.
- Scale/Graph Interpretation:
  - Interpretation and understanding of the scale was the most prominent difficulty that participants experienced across all the hangtag redesigns.
  - Participants agreed that the scale is easier to understand when whole numbers ranging from 0-10, rather than using decimal numbers.
  - Participants showed some preference for the scale where higher numbers indicate a higher tendency for rollover; thus a "worse" vehicle. Conversely, the scale in the majority of the tested designs communicates a measure of resistance to rollover, where higher numbers on the scale indicate higher resistance to rollover; hence a "better" vehicle.
  - Participants reported the scale design used in hangtag L was the easiest to understand.
- Pictorial Symbol:
  - The pictorial symbol considered to be the best was the image of just the ROV tipping over, without any stick figure flying out.
- Message Comprehension:
  - Although the explanatory text within the message panel provided useful information, there was general consensus that any description provided on the hangtag should be formulated in layman's terms as the terminology used in the tested designs was perceived as overly technical, such that it was too difficult to understand.
  - A vast majority of the participants agreed that the inclusion of an informational resource from which to procure detailed information was a good way to balance the information provided (being too complex versus not having enough technical details).

## **Redesign Recommendations**

Based on the feedback from the second round of evaluation, recommendations for the final hangtag design were developed as follows:

- The participants preferred the whole hangtag to be yellow. Thus, we recommend incorporating a yellow background on the entire area of the hangtag as opposed to the original hangtag design, which included a yellow background only in the heading panel of the hangtag.
- The participants reported that the term “Rollover Resistance” was confusing, thus changing the heading of the hangtag to “Rollover Guide” may be conducive to better hangtag message comprehension.
- While the pictorial symbol of a tipping vehicle was regarded as highly important and informational, participants were largely split over whether the inclusion of a “stick” figure to the icon of the tipping ROV was helpful or not. Overall, the stick figure seemed to introduce more confusion in understanding the pictorial symbol. Therefore, the image of the tipping vehicle without any additional elements should be sufficient for the intended informational purposes.
- Difficulty to understand engineering testing information presented on the hangtags was a major concern expressed across all the groups and different levels of experience with ROV. It is strongly recommended that the information provided is delivered in simple, easy to understand language, and with technical information presented in terms that consumers will understand.
- Based on the participants reactions and feedback, the supplemental information on ROVs’ rollover should include the following elements:
  - Information on the scale range and explanation of the rollover rating
  - Explanation how rollover hazards are determined
  - Information on resources that provide additional and more extensive explanation of the rollover rating measurement
- We recommend the final proposed hangtag design to be a 5-inch by 7-inch vertical design.

# 1. Background

Recreational Off-highway Vehicles (ROVs) are motorized vehicles designed for off-highway use. These vehicles are characterized by having four or more tires; bench or bucket seats for two or more occupants; automotive-type controls for steering, throttle, and braking; and a maximum vehicle speed that exceeds 30 miles per hour (mph). ROVs are also equipped with Rollover Protective Structures (ROPS), seat belts and other restraints, such as doors, nets, and shoulder barriers for the protection of occupants.

ROVs and All-Terrain Vehicles (ATVs) both are motorized vehicles designed for off-highway use, and both are used for utility and recreational purposes. However, ROVs differ significantly from ATVs in vehicle design. ROVs have a steering wheel instead of a handle bar for steering; foot pedals instead of hand levers for throttle and brake control; and bench or bucket seating rather than straddle seating for the occupants.

CPSC research has identified 550 ROV-related incidents that occurred between 2003 and 2013. There were 506 reported injuries and 335 reported fatalities related to these incidents. In 2012, CPSC staff conducted a multidisciplinary review of 428 ROV-related incidents that occurred between 2003 and 2011. A total of 428 incidents occurred, and of these incidents, 291 (68 percent) occurred due to a lateral rollover of the vehicle<sup>2</sup>.

The research identified that lateral stability and vehicle handling have the most effect on rollovers during a turn on a level terrain, because the rollover is caused primarily by lateral acceleration generated by friction during the turn. Therefore, CPSC proposed a requirement of ROV manufacturers, to provide information on rollover resistance for consumers on a hangtag to be displayed on the vehicles for sale. CPSC believes that providing information to the consumer on the stability of a ROV would influence some consumers to purchase more stable vehicles, and inspire manufacturers to produce vehicles with higher stability. This, in turn, would reduce the number of injuries and fatalities from vehicle rollover.

Therefore, it is of utmost importance in ROV rollover injury and fatality prevention efforts to design a ROV hangtag that effectively communicates safety information regarding rollovers, which will be able to influence consumers' purchasing and ROV usage behavior.

The purpose of this study was to evaluate the effectiveness of the hangtag in communicating the tendency of the ROV to roll over, as compared to other ROVs. The specific objective of this study was to test the content of the proposed hangtag in order to design an ROV hangtag that relays a clear and understandable message that will be considered when consumers are making purchasing decisions about a ROV. In order to accomplish this, the study explored perception, comprehension of the label message, and its design elements.

---

<sup>2</sup> Consumer Product Safety Commission, 2014. Safety Standard for Recreational Off-Highway Vehicles (ROVs). Notice of Proposed Rulemaking (Docket No. CPSC-2009-0087). Retrieved from <https://federalregister.gov/a/2015-01110>.

## 2. Study Design

### 2.1. Method

EurekaFacts conducted two rounds of evaluations to test and redesign the proposed hangtag that provides information on the recreational off-road vehicle (ROV) stability and resistance to rolling over. The first round of testing was conducted to evaluate the initial design of the ROV hangtag proposed by CPSC, to help brainstorm redesign recommendations that can meet expectations and needs of different consumers and users. Based on the first round evaluation results, ideas generated during the focus groups, labels and tags design guidelines, and feedback from CPSC, six alternative designs of the ROV hangtag were developed. The second round of testing evaluated the alternative versions of ROV hangtags to develop recommendations for a final ROV hangtag design.

#### ***First Round of Evaluation***

In the first round of evaluation, a hybrid approach was used that included combination of cognitive interviewing techniques and focus group research, to provide a reliable and comprehensive evaluation of perceptions of the initial hangtag design. This approach allowed examining, perception, and comprehension of the label message and design elements, as well effectiveness of the hangtag message in influencing attitudes and behaviors. EurekaFacts conducted a total of 10 cognitive interviews and two focus groups, consisting of five participants per group, where one version of the hangtag was being tested.

The cognitive interviewing technique is commonly used to test comprehension of communication materials and surveys. This method explores how respondents understand, process, and act upon information presented to them. Short, one-on-one cognitive interviews were used to evaluate the effectiveness of the ROV hangtag label, and to help us identify the reasons for any ineffectiveness. During the interviews participants were asked to evaluate the proposed hangtag message and design across the following dimensions: perception, comprehension, message credibility and relevance, and behavioral compliance with the label message. Following the cognitive interviews, respondents participated in the focus group portion of the evaluation to discuss the ROV hangtag. The focus groups concentrated on participants' knowledge and experience with ROVs and ROV rollovers, as well as what affects their ROV purchasing decisions. Participants also discussed their impressions and preferences regarding the hangtag message and design, and provided suggestions for hangtag improvement.

Based on the collected information from the first round of evaluation, the ROV hangtag message and design was redesigned to improve consumers' understanding of the label message and its effectiveness at communicating rollover information. Six alternative designs of ROV hangtags were developed with the purpose of being evaluated and discussed by participants in the second round of evaluation.

#### ***Second Round of Evaluation***

In the second round of the ROV hangtag study, three focus groups were conducted to evaluate the alternative versions of the hangtag design. Six hangtag designs were tested across the three focus groups consisting of ten participants per group. Two focus group sessions consisted of inexperienced ROV users and one focus group session included experienced ROV users. Inexperienced ROV users were classified as those users who had some knowledge about ROVs but did not own or have much experience operating ROVs. Experienced ROV users were classified as those users who either owned an ROV within the past five years and/or have a lot of experience operating an ROV.

Participants were asked to evaluate the six alternative designs across the same dimensions measured during the first round of testing: perception, comprehension, message credibility and relevance, and behavioral compliance with the label message. At the beginning of the focus groups, the participants

provided feedback on each hangtag version and their comparisons independently. Participants wrote their impression and understanding of the hangtags in response to a few generic questions before engaging in a group discussion. This procedure helped to safeguard from the influence of the group and is followed by the group discussion to help foster suggestions for improvement. Based on the input gathered from all of the focus groups, hangtag design standards, and CPSC staff, a final recommended design of the ROV hangtag was developed.

## 2.2. Study Population and Sample

The target population of this study includes the following groups: utility users - individuals who use ROVs for work (e.g. rural users, farmers), recreational users (e.g. outdoor sports enthusiasts), experienced ROV users, and potential new users. It is important to note that the study was more focused on consumers who are purchasing the ROVs and making buying decisions, not necessarily the users. This distinction is especially important in case of the utility users because a farmer or other person using the vehicle may not necessarily be making the purchasing or buying decisions.

EurekaFacts recruited a total of 40 participants (10 in Round 1 and 30 in Round 2) from the Washington, D.C. metropolitan area. The demographic characteristics of the participants are presented in Table 1.

Table 1: Summary of Sample Demographic Characteristics by Round of Testing

### Gender

Gender	Round 1	Round 2
Male	7	15
Female	3	15
<b>Total (participants)</b>	<b>10</b>	<b>30</b>

### Age

Age	Round 1	Round 2
18-30	4	3
31-40	0	4
41-50	2	15
51-60	3	6
61+	1	2
<b>Total (participants)</b>	<b>10</b>	<b>30</b>

### Race/Ethnicity

Race/Ethnicity	Round 1	Round 2
White/Caucasian	4	10
Black/African American	4	14
Hispanic/Latino	1	3
Asian	1	0
Other	0	3
<b>Total (participants)</b>	<b>10</b>	<b>30</b>

Since customers' purchasing behavior and decisions may vary depending on their knowledge or experience with ROVs, participants experience with ROVs varied from very experienced to potential new users who had very little knowledge of and experience with ROVs.

#### ***First Round Sample***

The first round of evaluation included 10 participants. Seven of the ten participants were considered experienced ROV users, as they reported having operated an ROV in the last 5 years. Three of these participants reported currently owning an ROV vehicle while seven out of ten participants indicated that they plan to purchase a ROV in the near future. Almost all the participants (9 out of 10) use a ROV for recreational purposes (e.g. outdoor sports enthusiast), while four participants also use it for utility purposes (e.g. rural users and farmers).

#### ***Second Round Sample***

The second round of focus groups consisted of a total of 30 participants. Two focus group sessions included inexperienced ROV users (20 participants) and one focus group session included experienced ROV users (10 participants).

Inexperienced ROV users were considered those participants who had some knowledge about ROVs but did not own an ROV and had little experience operating an ROV. Having little experience operating an ROV included those who either a) had less than 1 year of experience operating an ROV either rarely (1-3 times a year) or sometimes (4-10 times a year or less than once a month) or b) had less than 2 years of experience operating an ROV only rarely (1-3 times a year).

Those participants who either owned an ROV within the past five years and/or have a lot of experience operating an ROV were classified as experienced ROV users. Having a lot of experience operating an ROV included those who either a) had less than 1 year of experience operating an ROV at least once a month, b) had had more than 1 year of experience operating an ROV at least sometimes (4-10 times a year or less than once a month), c) had more than 2 years of experience operating an ROV.

#### ***Recruiting techniques***

The recruitment techniques involved multiple outreach/contact methods and resources, such as internet ads, individual emails, telephone recruiting, and on-site location-based recruiting. Specific outreach efforts were made to ROV groups, blogs, clubs, and social media groups related to ROVs, ATVs, and outdoor recreational activities. Flyers were posted in supply stores, ROV and ATV stores, farmers markets, and stores related to outdoor activities (e.g. Orvis, Bass Pro Shops, etc.). Telephone outreach was conducted using the EurekaFacts database of individuals who are interested in research participation. Participants were offered \$80 incentives to participate in the evaluation session.

## 2.3. Data Collection Procedure

### ***Generic Procedure***

Recruiting and data collection followed policies and procedures to ensure privacy, security, and confidentiality. The cognitive interview process and the focus groups in this study followed an OMB approved script and interviewer/moderator protocol. Upon arrival, participants were first welcomed and introduced to the interviewer/moderator. Participants were then informed they were present to help answer questions about the ROV hangtag. Participants were also reassured that their participation was voluntary and that their answers may be used only for statistical purposes and may not be disclosed, or used, in identifiable form for any other purpose except as required by law.

Written consent was obtained and participants were assigned a unique identifier (ID), created solely for data file management purposes, and used to keep all participant materials together. The participant ID was not linked to the participant's name in any way or form. The consent forms, which include the participant name, were separated from the participant interview files and secured for the duration of the study. They will be destroyed three months after the final report is released.

### ***First Round Procedure***

The first round of interviews consisted of a cognitive interview session and a focus group session, which lasted for two hours. The first session consisted of the cognitive interview portion of the study, which took approximately 20-30 minutes to complete. Upon completion of the cognitive interview, participants were escorted by the interviewer back to the front desk where all participants waited until everyone completed the first portion of the study. Next, all participants were escorted to a focus group room for the second portion of the study. Each focus group session lasted up to 90 minutes while participants discussed their ROV experience and the ROV hangtag label. At the end of the focus group session, participants were thanked, remunerated, and asked to sign a receipt for their incentive payment. The focus group sessions were recorded using Morae® software, controlled by a data logger, which recorded the conversation between the moderator and the participants. The data logger also took notes of key points raised from the discussion of each topic and observation of the participant's behavioral reactions to the hangtag.

### ***Second Round Procedure***

Based on evaluation of results from the first round of testing, six new proposed designs for the ROV hangtag were developed. Three focus groups were conducted to evaluate the new versions of ROV hangtags and the session lasted approximately two hours. Each hang tag design was presented and tested within two of the three focus groups. The set of hang tags shown to each group were selected in such a way that hangtags with similar or the same design elements were not shown sequentially. Additionally, the order of presentation also accounted for different sizes and orientations in each set of hangtag designs presented in each group. This reduced any potential effects of order presentation. After being presented with each hangtag design for the first time, participants reported their impression of the hangtag individually in order to avoid any potential effects on their reports or impression from the rest of the group. Each hangtag was presented to the participants independently and all hangtags were compared and viewed together only after participants provided feedback on each separately. Upon providing individual feedback, participants engaged in a group discussion on the presented hangtag designs.

At the end of the focus group sessions, participants were thanked, remunerated, and asked to sign a receipt for their incentive payment. The focus group sessions were recorded using Morae® software, controlled by a data logger, which captured the conversation between the moderator and the participants. The data logger also took notes of key points raised from the discussion of each topic and observation of the participant's behavioral reactions to the hangtags.

## 2.4. Protocols

### ***Cognitive Interview***

The cognitive interview process in the first round of testing followed the OMB-approved script and interview protocol. Interviewers used several different cognitive interviewing techniques, including concurrent think-aloud and item-specific probes, observation, and debriefing questions.

The primary approach available for the think-aloud component of the cognitive interviews was the concurrent think-aloud, in which the participant verbalized his or her thoughts while reading the information on the prototype hangtag. The cognitive interview protocols were developed to facilitate capturing respondents' thought processes during the concurrent think-aloud. The interviewers encouraged participants to voice all their thoughts aloud while reading the information presented on the prototype hangtag. The interview process also included a verbal probing component conducted after completion of the concurrent think-aloud portion for that task. The amount of verbal probing depended on the amount of information provided during the concurrent think-aloud. The topics discussed included attention and first impressions, communication of the ROV hangtag with regard to its' general message, and comprehension of the information presented on the tag. Interviewers explained the think-aloud process, conducted a practice question, and then participants analyzed the prototype hangtag.

### ***Focus Group***

The focus group process in this study followed the OMB-approved script and moderator guide. The moderator first introduced the focus group process, outlining the rules and specifications of the discussion, and then guided participant introductions. The guide was used to steer discussion toward the topic areas and the specific questions of interest within each topic area. The focus group structure was fluid and participants were encouraged to speak openly and freely. The moderator used a flexible approach to guiding the focus group discussion, as each group of participants may be different and may require different types of strategies.

The purpose of the focus groups was to gather thoughts, impressions, and recommendations on the ROV hangtag from a group of participants consisting of different levels of ROV experience, different uses (recreational vs utility), and different levels of familiarity or caution regarding ROV rollover.

Following the introduction to the focus group procedures and some background on the purpose of the focus group, the moderator led into the topics and questions for discussion. The topics of discussion included past experience with ROVs, purchasing behavior, and ROV hangtag impressions and understanding.

The following topics were discussed in the focus groups of Round 1 evaluation:

- knowledge of and experience with ROVs;
- knowledge of and experience with ROV rollover;
- ROV purchase decision making and behavior;
- identification – personal relevance of the ROV label;
- label message effect – call to action;
- hangtag design impressions and preferences; and
- suggestions for improvement.

In the Round 2 of evaluation the focus groups discussion was focused on the following:

- perception and first impressions regarding the hangtag;
- understanding of the hangtag's main message;
- comprehension of the information presented on the tag;
- label message effect on the participants attitude to ROVs and their usage;
- hangtag design impressions and preferences;
- suggestions for improvement;
- individual label evaluation and comparison; and
- group discussion and comparisons of effectiveness of different hangtag designs.

The second round of focus groups was more heavily focused on appraisal of the numerous redesigns of the hangtag, and which aspects were most impactful and effective.

## 2.5. Limitations

The key findings of this report are based solely on notes taken during the cognitive interviews and focus group discussions. Qualitative research seeks to develop insight and direction, rather than obtain quantitatively precise measures. The value of qualitative focus groups is demonstrated in their ability to provide unfiltered comments from a segment of the targeted population. While focus groups cannot provide definitive answers regarding the potential success of the hangtag, the sessions can play a large role in gauging its effectiveness and ensuring that the hangtag is improved, understandable, and useful in communicating the stability of the ROV. Furthermore, it is important to note that half of the respondents (15 out of 30) in the second round of evaluation were between the ages of 41 to 50. Although this group may be representative of the age range of inexperienced ROV users that were targeted in the second round, it also may be a possible limitation to the findings. The 2008 IRIS report on off-highway vehicle recreation<sup>3</sup> shows the highest participation among people under age 30, and decline of participation in older age groups. However, there are no recent and specific data regarding demographic distribution of ROV usage.

---

<sup>3</sup> The Internet Research Series (2008). Off-Highway Vehicle Recreation in the United States and its Regions and States: an Update National Report from the National Survey on Recreation and the Environment (NSRE). Retrieved from <http://www.srs.fs.usda.gov/trends/pdf-iris/IRISRec1rptfs.pdf>.

## 3. Round 1 Evaluations

The following section presents the results of the first round of evaluation based on the information collected during the cognitive interviews and focus groups. Focus groups included different types of ROV users. Group 1 consisted of recreational users (e.g. outdoor sports enthusiasts) and Group 2 included several utility users (e.g. rural users, farmers). Despite the different usage types of participants in these two groups, the results do not show considerable differences in the feedback regarding the tested ROV hangtag. The differences in participants' opinions were more dependent on the level of experience with and knowledge of ROVs. Thus, the results from focus groups were presented across both groups and combined with the results of the cognitive interviews. In order to present the comprehensive and holistic picture of the participants' perceptions and opinions regarding the hangtag, the results were not organized by types of methods used or type of groups. Instead, the results were organized by the topics or areas of the hangtag that were discussed and tested during the evaluation.

### 3.1. Results

#### ***Knowledge and Experience***

A majority of participants in both the recreational and utility user focus groups had up to five years of experience operating ROVs, although several participants reported that they had been driving ROVs since they were teenagers. The focus groups were almost evenly split among ROV owners and operators, ROV drivers/operators only, and prospective ROV buyers. There were no considerable differences in terms of experience between two focus groups. However, Group 2 included a wider range of level of experience and knowledge.

Participants learned about ROVs from many different sources, including:

- friends;
- watching others drive ROVs;
- ROV enthusiast websites and magazines; and
- YouTube videos.

Most of the ROV users in the focus groups were not current owners of ROVs, but had operated one in the last five years or were planning to purchase one. Many of the participants also had experience with different types of off-road vehicles, including: dirt bikes, ATVs, and four-wheelers.

A majority of participants indicated that they were at least aware of the potential for ROV rollovers. Furthermore, a majority of participants were aware that ROV rollovers can cause serious bodily harm. Some participants stated that more experienced ROV operating friends or family had warned them about potential safety issues, including rollovers. Furthermore, several participants reported witnessing ROV crashes and rollovers, either in person or on the internet.

#### ***Message and Comprehension***

##### *Attention*

In general, participants reported the proposed hangtag design to be attention grabbing, although this sentiment varied based on which portion of the hangtag that the participants were discussing. A vast majority of participants stated they liked the brightness of the yellow background and that it caught their attention. Furthermore, most participants reported that the icon of the tilting ROV also captured their attention, especially when paired with the yellow background and the rollover information.

However, several participants stated that the color choice of the hangtag was incorrect. They reported that the color yellow implied caution and that red or orange would have been a better fit. One participant stated,

“The tag should be red, not yellow. This one [the color yellow] is more yield, and it doesn’t even elicit a ‘caution feel.’”

Participants were less positive about the rest of the hangtag, including the graph and the text, explaining that they were not attention grabbing, and were, in some cases, confusing. Indeed, one participant described the hangtag (excluding the signal panel) to be “bland.”

In general, participants were in agreement when it came to reading the ROV hangtag. All but one of the participants stated that they would read the hangtag label in its entirety, although they gave differing reasons as to why. A majority stated that they would read it because it provided potentially important information.

### Comprehension

Only one third of the participants reported that they did not find any portion of the hangtag to be confusing. One of these participants did, however, state that although the hangtag was not confusing, it still did not provide enough information, stating “I do not think it is confusing, it just leaves me questioning. What kinds of things went into the test? I need more information.” These participants stated that the information provided on the hangtag should be understandable to someone who operates, or is considering purchasing, an ROV.

The majority of the participants, however, indicated that they found various portions of the hangtag confusing. The elements of the hangtag the participants had difficulty understanding includes the following:

- the rollover resistance graph/scale;
- the term “lateral acceleration;” and
- the hangtag explanatory text.

### Rollover resistance scale

A large majority reported that the graph/scale on the hangtag was confusing. These participants listed the following aspects of the scale that caused confusion:

- What it was measuring:
    - Several participants explained they thought it was measuring the speed of the vehicle. One participant stated that the chart was very confusing and that it “threw me off completely,” and another participant who claimed he understood the scale explained it as saying, “If the scale on the graph goes up to better, then that means you speed up and have more of a chance to rollover.”
  - The units used to measure the vehicles rollover resistance:
    - Several participants stated that they associated unit of measurement “g” with grams, while acknowledging that grams would not make sense in the situation.
    - One participant who did know that the unit “g” was referring to g-forces, found the provided information lacking, stating “How tight of a turn at what speed do you have to go to get 0.7g?”
  - The ‘Minimally Acceptable’ value:
    - One participant associated the minimally acceptable rating with having an exaggerated likelihood of rolling over, stating “...this vehicle has a very low rating, so it is likely to rollover,” while another participant thought that each vehicle would have its own minimally acceptable rating, rather than the rating being universal among ROVs.
  - The term ‘Lateral Acceleration:’
    - A majority of participants reported either that the term was confusing or stated that they understood it, but either were unable to describe it, or described in incorrectly. One participant described it as “[Lateral Acceleration] is the normal way you would ride, on a flat surface, just the way you would normally drive.”
  - Black box on the scale:
-

- One particular aspect of the scale that caused participants a great deal of confusion was the individual vehicle rating in the black box. One participant thought that the number in the black box was the actual minimal rating, while another participant thought that both the vehicles rating in the black box as well as the minimally acceptable number were the same thing, and that the minimally acceptable rating (0.7) was a simplified representation of the vehicle's rating (0.74).

#### Hangtag explanatory text

A majority of the participants stated they found the text at the bottom to be helpful, although to varying degrees and for different reasons. Several participants reported that the text at the bottom helped to fill in some of the "gaps" in information which were missing from the scale, such as the fact that the lateral acceleration was measured by doing a J-turn on a flat surface, while one participant stated "The text was helpful though, because without it the scale does not make much sense." Another participant described the text as being helpful because it "keeps people oriented or warned about what this [hangtag] is about." Among the participants who did not find the text to be helpful, the consensus was that the text was simply confusing; with one participant reporting they re-read the text multiple times.

#### Picture of tilted car

All of the participants understood that the icon on the signal panel was of a ROV that was tipping over, and combined with the yellow background, was attention grabbing. Despite their overall understanding, several participants expressed some interesting thoughts on the icon. One participant stated that they thought the icon was tipping over due to the low rating that the vehicle had on the scale, and another participant stated that it looked more like a jeep than a ROV.

#### Hangtag Message

In general, participants felt that the overall message of the hangtag was to inform buyers that ROVs do have the potential to rollover. However, participants were not in agreement regarding the specifics of the message being relayed in the hangtag and proposed several different interpretations. The most prevalent responses were that hangtag informs about the need to moderate one's speed while operating ROVs in order to minimize rollover. Only a few participants identified the message as telling potential buyers to compare vehicles. However, all of the participants did understand that the hangtag was informing them about some sort of potential danger of operating a ROV and that it was general safety information. One participant indicated that the yellow in the signal panel indicated that there was a risk, but that because it was yellow, it was a 'low warning.'

Although participants had difficulties understanding some information on the hangtag, it was stated that they would be able to identify which ROVs were better based on the scale included on the hangtag, and that the closer to the word 'better' and the farther to the right the vehicle was rated, the better it was. Several participants indicated that the word 'better' was out of place on the scale, and that it was not measuring which vehicles were 'better,' but rather which ones were 'safer.' These participants explained that when deciding which ROVs were 'better' they would consider such factors such as the seating, price, value, etc. However, two participants indicated that nowhere on the hangtag was any information to tell them which ROV was better and one of these participants stated that he would know which ROVs were better from doing his own research. The other participant indicated that the label would not tell them which ROVs were better because of a lack of trust in the label, stating "No, [there is nothing a label can do to denote if one vehicle is better than another] it is a trust thing."

#### Message Relevance

All of the participants were familiar with ROV rollover, and a majority found the message to be believable. One participant who expressed doubt regarding credibility of the message explained that it was because of

the color of the signal panel, which should be red, rather than yellow. Although none of them had experienced a rollover or crash first hand, one participant had witnessed a ROV rollover accident. That participant shared the experience with the focus group explaining, "I have seen a rollover, a young kid showing off, going fast horizontally on a hill. Luckily he was wearing a helmet; the kid was ejected from vehicle." Additionally, a majority of the participants had either heard from friends and family about ROV rollovers, or had seen videos on the internet on YouTube or Nitro Circus. Furthermore, one participant explained that an ROV operator would be familiar with ROV stability simply from driving an ROV, stating, "You know about rollover from driving experience, from seeing others. It is just not as safe as an automobile, [although] regular cars can flip over too."

Despite being aware of the potential risks associated with ROV operation, a majority of the participants also reported that there were many factors that can minimize the risk. They listed such factors as: how the operator drives (i.e. speed and other risky behaviors), wearing appropriate safety gear, driving sober, as well as road and weather conditions.

When discussing the relevance of the hangtag, many of the ROV owners reported that as they got older and more mature they began to take the safety features into account more. One participant summed up this sentiment, stating "I did not think about safety at first. Safety is always there, it's a matter of maturity; [at first] it is about the thrill."

Participants indicated that their decisions to read, skim, or ignore the labels, including warning labels, on products are usually related to familiarity with the product and perceived risk of danger associated with a specific type of product. For example, several participants stated that if they were highly familiar with a type of product, that they would be more likely to skim or ignore safety or warning labels or if they were buying something they saw as potentially hazardous (such as bleach, power tools, or vehicles) then they would be more likely to read the labels thoroughly.

Just under one third of participants said that they had seen hangtags which they thought were similar to the ROV hangtag. Two of the participants stated that they had seen such labels on similar off-road vehicles, such as dirt bikes and four-wheelers in power sports stores, and one participant likened the hangtag to warning labels that he has seen on lawnmowers at stores like Home Depot.

#### *Message Effect*

There was agreement among participants that the label message was relevant and necessary, however there was much less agreement on how it affected the way they thought about ROVs. Several participants stated that they would not purchase the hypothetical ROV described in the hangtag because it had a low rating, while, conversely, others stated that operating an ROV was no different from driving a car and that they knew there was a certain level of risk associated with the operation of ROVs. Furthermore, the intended use of the ROV, as well as a person's temperament affected how the message was received. One participant stated "I would want a good safety rating, but I have friends who care more about handling." Utility users were, on average, less worried about rollovers, as they reported using their ROVs in different manner which made stability less of a concern, while recreational users were more interested in fun and speed. One recreational user stated, "It [the rollover rating] tells me I want to get those with better ratings. This [hypothetical vehicle] needs a better rating, so you can go faster without rolling over."

#### *Purchasing Decision*

The purchasing decision process was discussed with both ROV owners and non-owners. Owners were asked to discuss the factors that drove their purchasing decisions. Non-owners were asked to consider the hypothetical situation of a ROV purchase in the immediate future and what factors potentially would affect their decision. Several participants reported that the main things they considered while buying a ROV were

the age, model, and condition of the ROV they were thinking of purchasing. The features of the ROV were another area mentioned, and participants included factors such as the number of passengers, the seating, and the presence or absence of a truck bed. One area in which there was more agreement was the price of the ROV purchased; including participants who purchased used ROVs from dealers, as well as from friends or family.

Despite consensus among the participants that the hangtags were of more use to new and inexperienced ROV drivers, neither experienced nor inexperienced ROV owners or potential ROV owners listed safety as a primary factor influencing their purchasing behaviors, despite their familiarity with the potential for ROV rollovers. Furthermore, when safety was mentioned by both experienced and non-experienced ROV operators, rollover was not a primary focus. Rather the focus was on wearing safety gear, not driving while intoxicated, and maintaining a safe rate of speed. In general, the discussion on ROV safety tended to put the burden on the individual and their safety behaviors. One participant noted that this was especially relevant because there is little to no enforcement of any safety behaviors from police.

### ***Participant's Impressions***

Participants' impressions and opinions on the hangtag depended largely on their level of experience operating ROVs and usage type (e.g. recreational vs. utility). However, there were some aspects of the hangtag that were not affected by users' experience level. First among these were the size of the ROV hangtag and the size of the text on the hangtag. Regardless of the experience and usage type, participants preferred the hangtag to be larger, and most felt that the text should be as large as possible, so that even people who wear glasses can read it. Additionally, participants' opinions were mixed about the color of the signal word panel of the hangtag; some felt that it was appropriate with the yellow background, while some thought it should be red.

Participants' impressions regarding the hangtag show a clear distinction between experienced and non-experienced users. In general, more experienced users felt the hangtag did not provide enough details, including the speed at which the vehicle was traveling during the J-turn test, the angle of the J-turn, and the wheelbase of the vehicle. On the other hand, in-experienced users were more likely to state that the hangtag was confusing, and asked for definitions of terms like J-turn and lateral acceleration, and for simpler "layman's language."

Comparing the impressions of recreational and utility users also illustrates a divide among participants. Utility users were less likely than recreational users to concern themselves with the speed of the vehicle during the rollover test, as they reported both driving their ROVs at lower speeds, and that their ROVs were often unable to travel at high speeds. Additionally, two experienced ROV operators (one utility and one mixed-use) stated that it would be helpful to know the conditions (ROV speed and angle of the turn) that would lead to a J-turn producing 0.7g of force.

### ***Participant Suggestions for Improvement***

During both the cognitive interviews and focus groups the participants appeared enthusiastic to be able to offer their input on potential ways to improve the ROV hangtag. A majority of participant suggestions included alterations to the scale and the text provided in the hangtag, although there were some participant suggestions to change the icons and colors in the signal panel as well.

The most common participant suggestions for improvement included alterations to the scale presented in the hangtag. Despite the high number of participants who stated that the scale was confusing, few participants offered any specific suggestions for improvement, but a majority stated that the scale needed to be simplified.

The following suggestions for improvement of the scale were proposed:

- color coding the scale in order to facilitate easier comparison of different ROVs
- replacing the scale with a pictorial or graphical representation of the hazard
- replacing the numbers in the scale with verbal categories describing rollover likelihood such as: less likely, likely, more likely, etc.

The text presented at the bottom of the hangtag was another area that prompted many suggestions for improvement. In general, many participants stated that the text font should be larger to facilitate its readability. There was also agreement among the less experienced participants that the text should be simplified, with one participant explaining that the text should use “layman’s language” so it would be more understandable. Other participants, including more experienced users, provided suggestions that the text needs to be more understandable, including a suggestion to provide a definition of ‘lateral acceleration.’ In addition, participants noted that an explanation of the phrase ‘compare before you buy’ would be helpful to clarify that the buyer is being told to compare the ROV to other vehicles in the same class, e.g. to compare a four seat ROV to another four seat ROV, and not to a different type of ROV or a different type of off-road vehicle. Among the more experience participants, there was general agreement that the textual information about the rollover test should be expanded upon to include important factors such as the speed the vehicle was traveling during the test, as well as the angle of the turn, and the wheelbase of the vehicle.

Regarding the icon and language presented in the signal panel, participants suggested various changes, including:

- increasing the size of the hangtag heading ‘Rollover Resistance’;
- increasing the size of the ROV icon;
- adding ‘action lines’ and/or an injured stick figure with ROV icon; and
- altering the color of the signal panel to red or orange.

Finally, some participant suggestions pertained to the overall design of the hangtag, such as the layout, size, and position of the hangtag. In general, participants stated they thought the hangtag should be in a vertical format, larger, non-removable, and that the layout should be altered so the text is made more pertinent to the scale.

## 3.2. Conclusions

A group of experienced and less experienced ROV users, for both recreational and utility purposes, participated in cognitive interviews and focus group sessions for the purpose of testing the ROV hangtag. The study was geared toward examining various aspects of the ROV hangtag design, as well as how the hangtag affects subjective evaluations, attention, comprehension, and behavioral compliance. An important property of the hangtag communication effectiveness we examined was how information presented on the hangtag affects participants' perceptions of ROV rollover and behavioral compliance.

The general impression gathered from these discussions with participants was that the title "Rollover Resistance" and the pictorial symbol used to depict a rollover were the most salient aspect of the hangtag. The signal word panel of the hangtag seemed to be especially conspicuous as it quickly captured the participants' attention.

The majority of the participants indicated that they found various portions of the hangtag confusing. Interpretation and understanding of the scale was the most prominent difficulty that participants experienced with the hangtag. Although the scale was informative, participants concluded that it is difficult to understand and needs to be simplified. Specifically, participants were not sure exactly what the scale is measuring and what units were used to measure the vehicle's rollover resistance, specifically "g." In addition, there was a lot of confusion among participants regarding the term 'Lateral Acceleration.' Participants reported that the term was confusing, or stated that they understood it, but either were unable to describe it or described it incorrectly. Some participants also misinterpreted the minimal acceptable rating and individual vehicle rating presented on the scale.

Although the text provided below the scale within the message panel provided useful information, there was general consensus that the terminology needed to be simplified because it was too technically complex and difficult to understand. Both experienced and less experienced ROV users had considerable difficulty understanding or explaining the engineering terms used on the label. All participants agreed that the way information was presented on the scale was somewhat difficult to understand and that the information was too complex.

A majority of participants concluded that the overall message of the hangtag was to let potential buyers know that ROVs do have the potential to rollover, or to moderate one's speed while operating ROVs in order to minimize rollover. Only a few participants identified the message as telling potential buyers to compare vehicles.

Participants' suggestions for improvement were mostly focused on alterations to the scale of the hangtag, and the text presented in the bottom portion of the hangtag. A few participants suggested adding a "stick" figure to the icon of the tipping ROV, and changing the color of the signal panel from yellow to red.

There was unanimous agreement among the participants that the scale needs to be modified in an effort to make it simpler and more understandable. One suggestion that emerged from both of the group discussions recommended color coding the scale from red to green to indicate the vehicles rollover resistance.

A second area of near unanimous agreement between both focus groups was related to the text presented on the hangtag. Participants of both focus groups recommended that the technical text be made less complex and more understandable. Participants suggested using more understandable "layman's language" and replacement of text with graphical representations whenever possible.

Those who are less familiar with ROVs and used them less frequently had more difficulty understanding the hangtag than more experienced ROV users. Importantly, those who were less familiar with ROVs also

considered the hangtag to be more informative, relevant, and something that would influence their purchasing behavior because they do not have as much knowledge or experience with rollover in ROVs as experienced users. The experienced users, on the other hand, were aware of the safety precautions with regard to the rollover and, when purchasing an ROV, generally tend to consider features other than safety, such as price, comfort, features it offers, and overall quality. Thus, it is especially important to redesign the ROV hangtag keeping in mind those who are less experienced ROV users and novel users. Furthermore, it is important to ensure that people of different ages, literacy, education levels, and experience be able to understand the message presented on the hangtag. Although it is not feasible to design a hangtag that would address every individual difference, the redesigned labels will be tested on target populations to which the hangtag will apply, but careful consideration will be made to make the hangtag especially understandable to those who are novice ROV users, and potentially unfamiliar with rollover.

### 3.3. Redesign Recommendations

The large body of research on how presentation and formulation of information on hangtags can ensure effectiveness of safety communication and behavioral compliance contributes useful suggestions for the improvement of the ROV hangtag design. Therefore, in order to ensure effectiveness of messaging provided on the hangtag, the recommendations for improvements and redesign were informed by consumer participants' feedback as well as the theory- and research-based guidelines for warning labels and safety communication design. In the following section, we describe how the participants' feedback and guidelines regarding the safety communication were applied to the hangtag redesign to ensure effectiveness of the messaging presented on the hangtag.

The first requirement of effective safety communication is to be noticed and to capture attention when presented in a field of competing visual stimuli. To improve noticeability, it is crucial that a label is salient, meaning that it must stand out and be prominent. Research has shown that salient safety labels increase the likelihood of consumers reading a label<sup>4</sup>, understanding the message<sup>5</sup>, recall of information,<sup>6</sup> and compliance<sup>7</sup>. Some of the ways in which salience of the hangtag can be enhanced is by using (1) large, bold print, (2) high contrast, (3) color (yellow background), (4) borders, and (5) pictorial symbols.

This section discusses how the participant's feedback on each component, as well as guidelines for safety labels and tags, informed the redesign recommendations.

#### **Heading Panel**

Participants indicated they liked the heading "Rollover Resistance" because it was noticeable and it stood out to them. They also mentioned they liked the large font and the bold format of the text. In addition, focus group discussions revealed that several participants thought the tag color should be changed to orange or red to yield a greater sense of caution and importance. However, according to standards for communication safety information to drivers of utility vehicles, the heading panel area should be yellow, with the text and the alert symbol in black<sup>8</sup>. According to ANSI standards, the color used in the signal/heading area of the warning label designates different levels of hazard seriousness in relation to the probability of interacting with the hazard and the probability of injury. Red color in combination with signal word "Danger" indicates the highest level of hazard, orange color in combination with signal word "Warning" signifies a lower level of danger, and yellow color denotes the need for caution<sup>9</sup>. Because the hangtag label is an informational label intended to encourage buyers to compare rollover resistance between vehicles and make safer choices when purchasing a vehicle, based on ANSI standards, the yellow background of the signal panel would be most appropriate for this type of safety communication.

---

<sup>4</sup> Strawbridge, J.A., 1986. The influence of position, highlighting, and embedding on warning effectiveness. In: *Proceedings of the Human Factors Society 30<sup>th</sup> Annual Meeting*. Human Factors Society, Santa Monica, CA, pp.716-720.

<sup>5</sup> Young, S.L, Wogalter, M.S., 1990. Comprehension and memory of instruction manual warnings: Conspicuous print and pictorial icons. *Human Factors*, 32, 637-649.

<sup>6</sup> Griffith, L.J., Leonard S.D., 1995. Effectiveness of warning labels as a function of visual impressions. In: *Proceedings of Human Factors Society 39<sup>th</sup> Annual Meeting*. Human Factors Society, Santa Monica, CA, p. 931.

<sup>7</sup> Hopkins, J.S., Parseghian, Z., Allen, R.W., 1997. A driving simulator evaluation of active warning signs. In: *Proceedings of Human Factors and Ergonomics Society 41<sup>st</sup> Annual Meeting*. Human Factors Society, Santa Monica, CA, pp.921-925.

<sup>8</sup> Foley, J.P., 2006. Regulatory requirements for motor vehicle warnings. In: M.S. Wogalter. (Ed.), *Handbook of Warnings*. Lawrence Erlbaum Publishers, pp. 553-563.

<sup>9</sup> Peckham, G.M., 2006. An overview of the ANSI Z535 standards for safety signs, labels, and tags. In: M.S. Wogalter, (Ed), *Handbook of Warnings*. Lawrence Erlbaum Publishers, pp. 437-443.

The warning design guidelines suggest that the signal word panel should also contain the safety alert symbol, such as the alert symbol that depicts an exclamation point within a triangle. The addition of an alert symbol has been found to attract consumer attention to the safety labels<sup>10</sup>. This symbol is intended for use on a safety sign whenever the hazard involves potential human injury. Given that there is a potential for human injury due to the stability of ROV vehicles, the safety sign is relevant and it may improve saliency of the message. Because participants recommended denoting a greater level of caution on the ROV hangtag, we included the safety alert symbol in a few versions of the redesigned labels.

### ***Message Panel Description***

The rollover resistance scale is intended to present information about the rollover resistance for the specific make and model of ROV vehicle. However, in order for the safety communication to be effective, the information presented must be clear and understandable for the intended audience. A majority of participants reported or showed confusion regarding the rollover resistance scale. The most prominent issues seemed to be difficulty understanding the “lateral acceleration” measure, the unit “g”, and the rollover resistance value of the vehicle discussed.

Confusion with regard to the direction of the scale and its overall meaning also appeared to be a significant difficulty. This confusion may have occurred for two possible reasons. First, it could have been a result of participants having difficulty with understanding the units and the terminology presented on the scale. Second, it could have been the result of the misunderstanding of the direction of the measure presented by the scale. The current version of the scale presents a measure of a vehicles’ rollover resistance where a higher value means more resistance, and hence indicates a “better” vehicle. Alternatively, a scale could present a measure of a vehicle’s tendency to rollover, where a higher value indicates a higher tendency to rollover, and hence a “worse” vehicle. One of these two scale directions may be more intuitive and easier to understand for the user. Because this was such a prominent issue in the participant’s feedback during testing, we designed a number of different versions that address this issue to various degrees, in an attempt to find the optimal presentation of this information.

In order to help clarify the message and information presented on the scale, participants recommended several revisions to the tag. First, in both focus groups, participants recommended that the scale should be represented using a color gradient (red, yellow, green) scale. The participants explained that this would clarify that lower values of lateral acceleration are worse (red) and higher values are better (green). Furthermore, they indicated that it helps make it easier to compare between vehicles since a line indicating that a vehicle is within the red zone, for example, is easier to compare to a vehicle in the yellow zone, rather than having to compare and remember numerical values. Although both groups recommended using a color gradient in the hangtag, the standard for safety labels is that the message area must be white with black text. However, because both focus groups presented clear preference for a version that includes a color gradient, we decided to test one version following the participant’s recommendations.

In the second portion of the message panel, the supplemental information on the ROV’s rollover resistance is provided. The text communicates that an ROV is susceptible to rollover and that rollover cannot be eliminated for any vehicle. Overall, participants considered the description helpful, informative, and important in supplementing the rollover resistance rating scale. However, participants had considerable difficulty with

---

<sup>10</sup> Rousseau, G. K., and Wogalter, M.S., 2006, Research on warning signs. In: M.S. Wogalter. (Ed.), Handbook of Warnings. Lawrence Erlbaum Publishers, pp. 147-158.

some of the terminology used within the description. In particular, a majority of participants struggled with the term “lateral acceleration” and the statement “Lateral acceleration is measured during a J-turn test.” The importance of the description is to provide users with an explanation of the rollover resistance rating and measurement so that people understand the need to compare resistance to rollover across different vehicles. Although the information must be descriptive, it should not be so lengthy that very few people choose to take the time to read the text. Additionally, the text must be easy to understand by users of different backgrounds and educational levels. Given that participants had considerable difficulty with understanding the text, all redesigned versions of the hangtag are modified to some extent to try to reduce the complexity of the text. The extent to which the text is modified varies depending on the version. Based on both participant feedback and the standards for effective warning label designs, the description has been modified to remove complex engineering terminology, to simplify the language, and in some cases to shorten the text in an effort to balance completeness and brevity.

### ***Pictorial Symbol***

Including a pictorial symbol in a label increases its salience and the likelihood of the label being noticed. Furthermore, the use of pictorials in safety labels enhances memory of the label<sup>11</sup>. It is especially important to ensure that the pictorial symbol used in the ROV hangtag label facilitates label message comprehension. All participants understood that the pictorial symbol was an ROV tipping over and agreed that the symbol was helpful in understanding the overall message and it was attention drawing. However, a few participants recommended making modifications to the pictorial symbol in order to make it clearer that the vehicle is tipping over. Some recommendations included adding an arrow to depict the rollover motion of the vehicle, including a slippery path image, adding a line to depict the surface underneath the vehicle, and including a stick figure being thrown out of the vehicle to show the hazard of rollover. Given that the rollover label already used in utility vehicles includes an image of the surface from which the vehicle is tipping over, we incorporated this recommendation into our redesign of new hangtags. Furthermore, the optimal symbol defines the nature of the hazard as well as the consequence of the hazard due to non-compliance<sup>12</sup>. Since both focus groups provided a suggestion for inclusion of a stick figure flying of the vehicle on the hangtag, we included this recommendation in some of the designs for further testing.

Although, the image was considered informative and attention grabbing, participants recommended making it larger and more prominent. Because the pictorial symbol does translate so much importance in presenting the overall message and the hazard related to rollover, we will also be testing participant's reactions to different sizes of the pictorial symbol in redesigned versions of the ROV hangtag.

---

11 Young, S.L., Wogalter, M.S., 1990. Comprehension and memory of instruction manual warnings: Conspicuous print and pictorial icons. *Human Factors*, 32, 637-649.

12 Rousseau, G. K., and Wogalter, M.S., 2006, Research on warning signs. In: M.S. Wogalter. (Ed.), *Handbook of Warnings*. Lawrence Erlbaum Publishers, pp. 147-158.

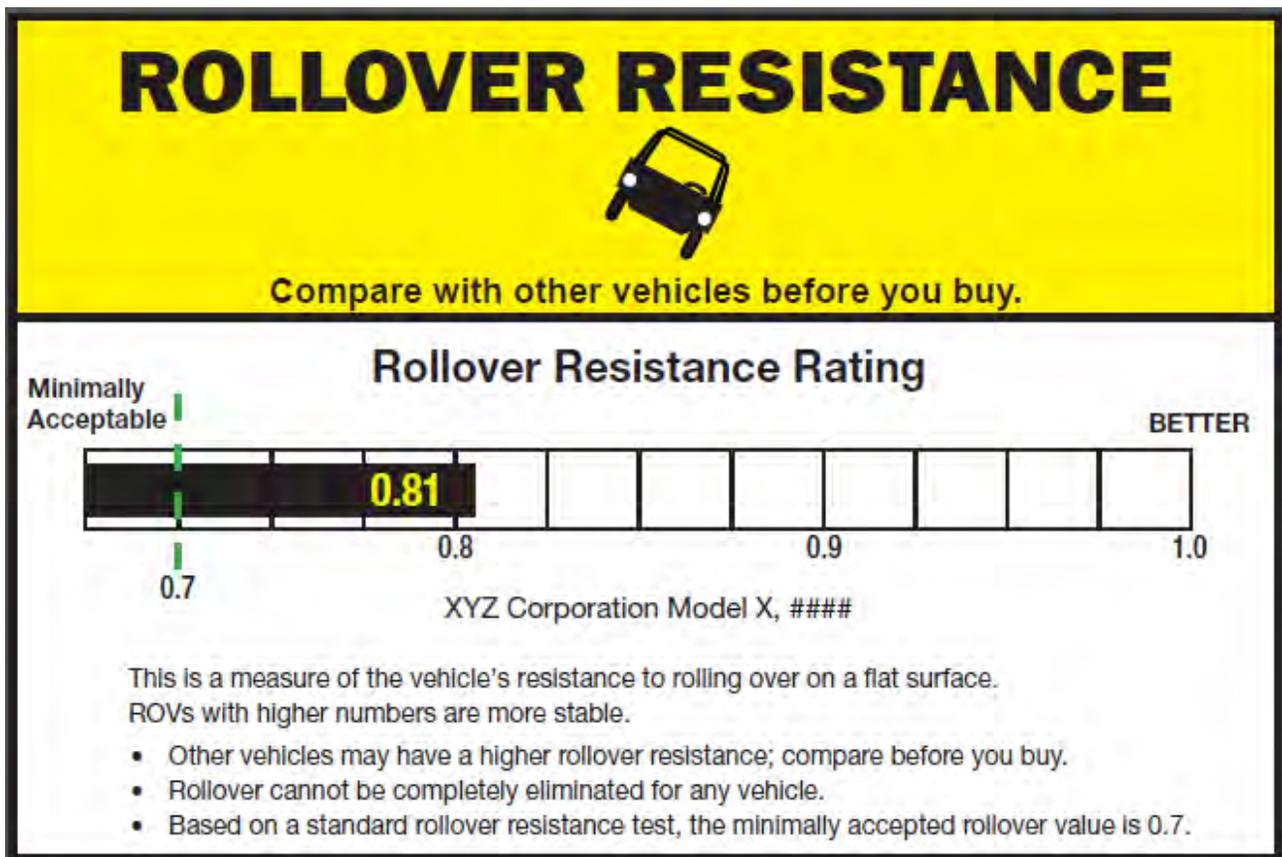
### 3.4. Proposed Alternative Designs

Based on evaluation of the initial ROV hangtag design via the findings obtained from the cognitive interviewing and the focus groups, six alternative designs were created. The proposed designs were created to address confusion or misunderstanding among participants during testing, and to incorporate participant's thoughts and recommendations for improvement of the hangtag. The proposed modifications to the original hangtag design vary from minimal to more extensive, including minimal modifications in the terminology used on the scale, modification in the scale units, change in the scale appearance, and reversal of the scale direction such that higher numbers indicate higher tendency to rollover. Testing of these different versions will then allow us to select the design where the message is easiest to understand.

#### **ROV Hangtag Version K**

This version of the ROV hangtag included only minimal modifications to the original hangtag version. The features of the hangtag that were considered salient and understood were kept the same and only minor changes were made to the layout and the terminology. During the cognitive interviews and the focus groups, participants had difficulty understanding the terminology used on the hangtag. This version of the hangtag does not delve into the details of how the rating is developed and assigned but rather provides a more generalized statement indicating that the rating is "based on a standard rollover resistance test." Thus, in this version an attempt was made to avoid engineering terminology and to simplify the language of the hangtag messaging used to describe rollover resistance measures. Version K was tested using a horizontal 4-inch by 6-inch hangtag format.

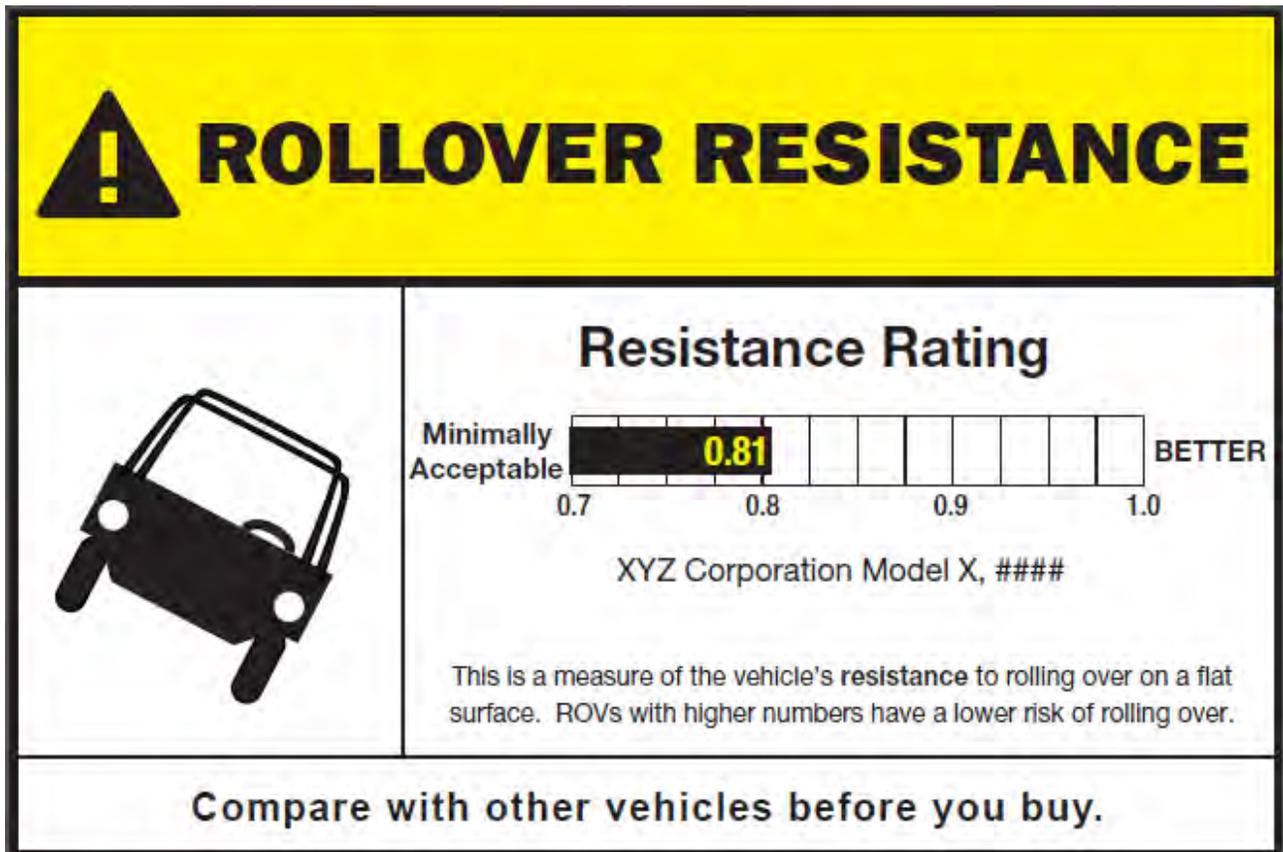
**Figure 1. ROV Hangtag Version K**



**ROV Hangtag Version N**

The following version is designed to test a different format commonly used for safety labels and signs according to ANSI Z535.2 standards<sup>13</sup>. The information presented in this version is the same as on the original hangtag, except that the format and layout of information follows a different standard. Here the signal word panel is presented at the top with an alert symbol, the pictorial presentation of the tilted vehicle is on the left side of the tag, and the right side of the tag contains the message panel including information on the resistance scale and explanatory statement. The different layout of information allows us to test which format is most conducive to making the label more salient and easier to understand. A modification was made to the descriptive text provided beneath the scale in an effort to simplify the tag and make it less visually busy. Version N was tested using a horizontal 4-inch by 6-inch hangtag format.

**Figure 2. ROV Hangtag Version N**

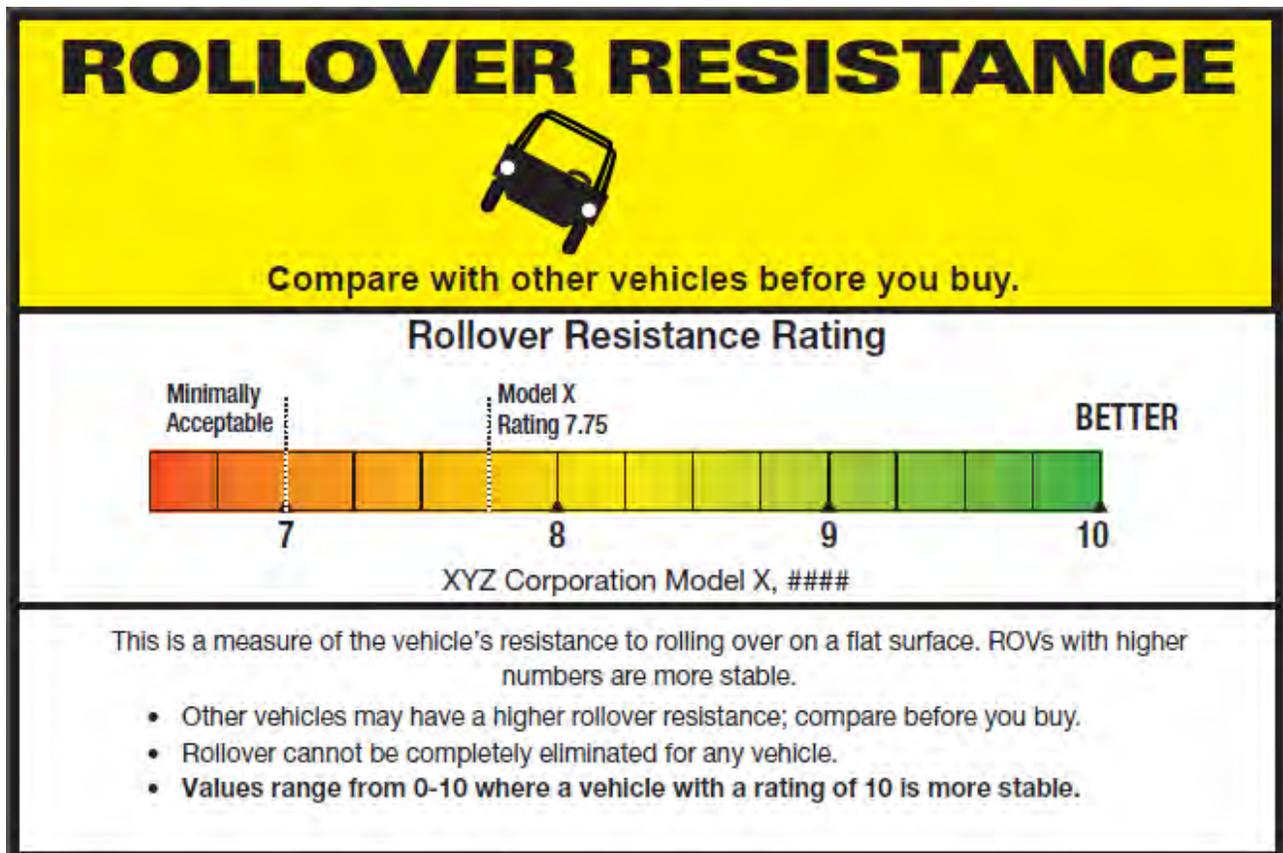


<sup>13</sup> Rousseau, G. K., and Wogalter, M.S., 2006, Research on warning signs. In: M.S. Wogalter. (Ed.), *Handbook of Warnings*. Lawrence Erlbaum Publishers, pp. 147-158.

### ROV Hangtag Version O

The third version of the ROV hangtag has been designed primarily to incorporate participants' suggestions for color-coding the scale to indicate the vehicle's rollover resistance. This hangtag includes a scale that uses a color gradient (red, yellow, and green) to depict the transition visually from a vehicle that is less acceptable (red) to more acceptable (green) with regard to its rollover resistance. Interestingly, both focus groups generated the idea of including a color gradient to represent the vehicle's rollover resistance and indicated that this type of representation would make it easier to compare between different vehicles when making a purchasing decision. Although inclusion of a color gradient in a hangtag does not follow ANSI standards and guidelines for safety label design<sup>14</sup>, we included this version in the second round of focus groups because a large number of participants from both first rounds of focus groups agreed that this design would make it easier to understand the information presented on the label. Version O was tested using a horizontal 4-inch by 6-inch hangtag format.

Figure 3. ROV Hangtag Version O

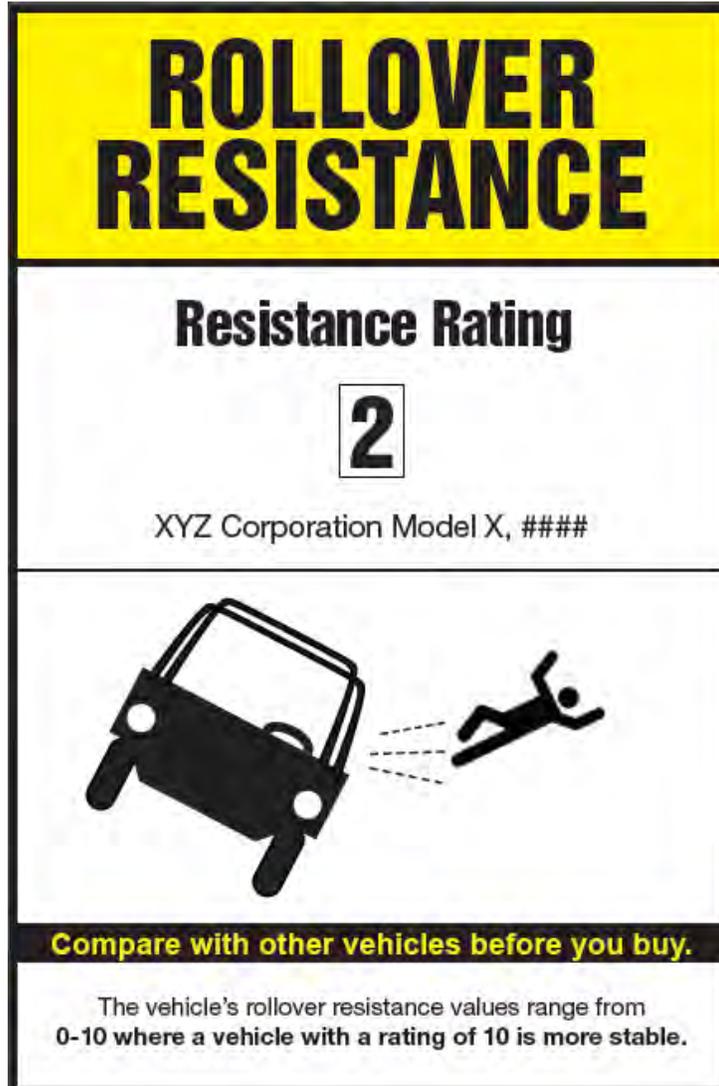


<sup>14</sup> Foley, J.P., 2006, Regulatory requirements for motor vehicle warnings. In: M.S. Wogalter. (Ed.), *Handbook of Warnings*. Lawrence Erlbaum Publishers, pp. 553-563.

### **ROV Hangtag Version M**

This version of the hangtag differs considerably from the original version tested and from previously presented alternative designs. This version of the hangtag is aimed at simplifying the presentation of the resistance rating for the vehicle. Because many participants either did not understand or incorrectly interpreted the rollover resistance scale, this hangtag was designed to avoid presenting the resistance scale and simplify presentation of this information. To simplify the hangtag, we included only a numerical value of the rollover resistance rating specific to this vehicle. This information is located immediately underneath the heading panel so that it is one of the most prominent features on the tag. Furthermore, the center of the hangtag includes a large symbol illustrating the hazard associated with an ROV rolling over. Finally, on the lower end of the message panel, users are instructed to compare the vehicles and given an explanation what the resistance rating indicates. This version follows closely ANSI guidelines on the warning labels design. Although the ROV hangtag is not a warning label, ANSI guidelines allow achieving the most optimal presentation of information for quick perception and understanding of safety information. Version M was tested using a vertical 4-inch by 6-inch hangtag format.

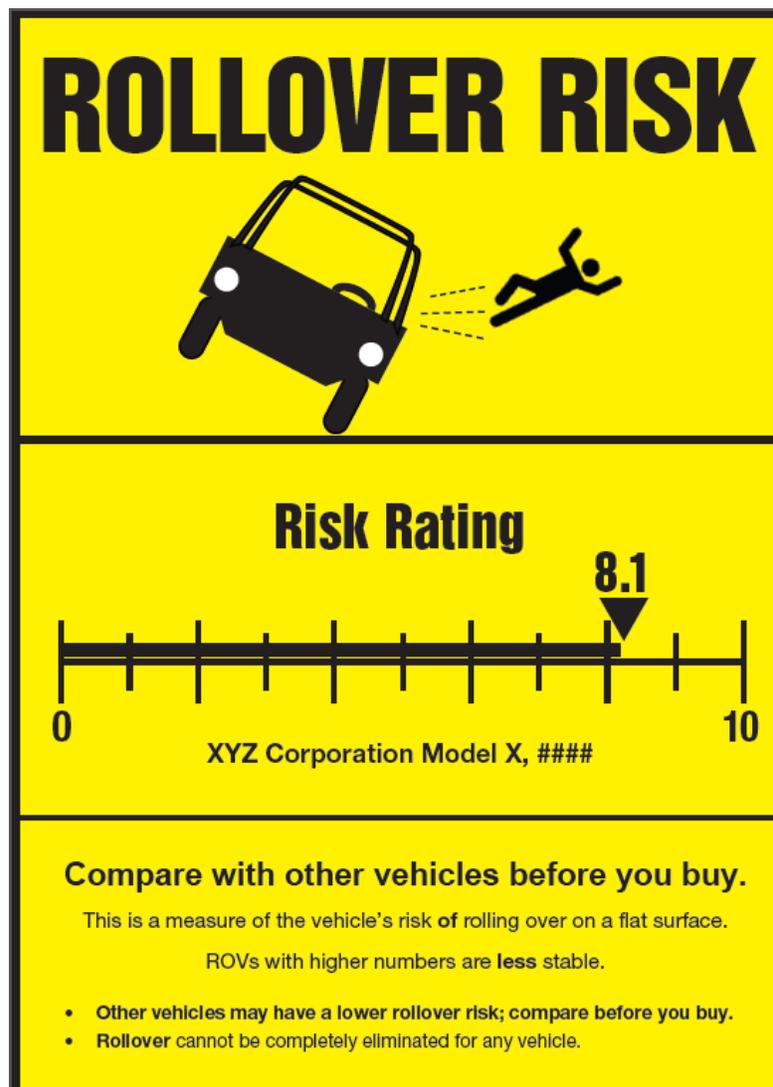
**Figure 4. ROV Hangtag Version M**



### ROV Hangtag Version L

The design of this hangtag followed the example of the energy products guide hangtag. The purpose of this redesign is to simplify presentation of the rollover rating scale by using a different approach. Rather than presenting the customer with a vehicle's resistance to rollover, where a higher number is indicative of greater resistance to rolling over, the direction of the scale here is reversed. Here the label presents the customer with a rollover risk rating instead, where a higher number is indicative of a higher tendency to rollover. For this approach, a transformation method will need to be developed to recalculate the rating based on the lateral acceleration measure. This design allowed to test which direction of the scale is easier for participants to understand. Version L was tested using a vertical 5-inch by 7-inch hangtag format.

Figure 5. ROV Hangtag Version L



## ROV Hangtag Version J

This version of the ROV hangtag was based on the comments and suggestions provided by Outdoor Power Equipment Institute (OPEI) in their public comments to CPSC's Notice of Proposed Rulemaking (comment N CPSC-2009-0087-0693). OPEI proposed to use a different measure of rollover resistance- lateral stability- based on the tilt table lateral stability test. In this test, a stationary vehicle is tilted in increasingly higher angles until all four wheels are no longer in contact with the surface, at which point the highest angle with four wheel contact is recorded. This is a different approach than in the rest of the hangtag designs, which utilized the lateral acceleration measure, based on a J-turn maneuver test on a flat surface. Furthermore, the hangtag J instead of scale/graph is using a single lateral stability rating representing the highest angle at which the vehicle was able to maintain four wheel contacts. The hangtag information panel presents explanation of the lateral stability rating, how this measure was obtained and inform about minimal acceptable value. Hangtag J was tested using a vertical 5-inch by 7-inch hangtag format.

Figure 6. ROV Hangtag Version J

# ROLLOVER RESISTANCE

## Lateral Stability



# 39°

Lateral stability as determined by manufacturer in accordance with the tilt table lateral stability test.

**XYZ Corporation Model X, ####**

### Compare before you buy.

**This is a measure of the surface angle that will cause a non-moving vehicle to tip over.**

- **Lateral stability** value shows the average angle when the uphill wheels lose contact with the ground surface
- Vehicles must have four-wheel contact up to at least 33°
- Higher angles represent greater static lateral stability

Compare before you buy. Other vehicles may have a higher lateral stability.

**⚠ WARNING:** Rollovers cannot be completely eliminated for any vehicle. Improper use, abrupt maneuvers, and operating the **vehicle** on steep slopes or at speeds too fast for the conditions raises the risk of tipover or roll-over.

## 4. Round 2 Evaluations

The second round of evaluations used focus groups to test six alternative designs of ROV hangtag. In this round, participants were stratified by their level of experience with ROVs to avoid any possible bias from engaging in a group discussion with more experienced drivers. A total of 30 participants took part in focus groups, Group 1 and Group 2 comprised of 20 less experienced drivers who were considering buying an ROV; and Group 3 comprised of 10 experienced owners/operators. The study was more focused on less experienced ROV users, since it assumed that due to lack of knowledge and experience with ROVs, they may have more challenges understanding technical information regarding ROVs. The study was geared toward examining various aspects of the ROV hangtag designs, and which alternative designs were the most effective in the areas of attracting attention, comprehension of the hangtag message, and behavioral compliance. Participants provided their subjective feedback on four hangtag redesigns first working individually and then in a group discussion. Upon completion of the group discussion, participants then offered feedback and suggestions for the final redesigned hangtag. The following section presents a summary of the results of the second round of evaluations.

### 4.1. Results

#### **Hangtag K**

Design K was a horizontal 4 by 6 hangtag that was presented to two groups, one group of less experienced ROV users and one group of more experienced ROV users. Across all tested designs, this hangtag was most similar to the original hangtag evaluated during the first round of evaluations. A majority of participants understood that hangtag K was informing them of the risk of rollover while driving a ROV. Despite understanding the general message of this hangtag, a majority of participants stated that the hangtag was highly confusing to them and burdensome to read. Overall participants' impressions were that the tag was too busy and difficult to understand, stating the hangtag was "too busy, people are lazy and don't like to read" and their "first thought was that it was confusing." One participant described his first impression of the hangtag as, "It [hangtag K] makes me think of work, like I am about to take a test."

#### **Signal Word Panel**

The participants provided very little feedback on the signal word panel on hangtag K. The comments referencing the signal word panel were mostly positive, praising the panel for being clean and simple. One participant stated that it reminded him of "a warning label," while another explained that the tilted ROV icon made her "...think of safety. I saw the tilted vehicle, [and it] makes me think of driving safely."

#### **Scale/Graph**

Participants found two aspects of the scale especially confusing:

- The range of the scale from 0.7 to 1.0; and
- The use of decimal points.

Several participants explained that one of the difficulties with the scale that it started just under 0.7. As a result, it is difficult to assess the safety of the vehicle because the scale did not provide a whole range for comparison purposes and therefore the vehicle's rating could be considered misleading. Several participants explained that despite .81 being relatively close to 1.0 (a high rating), its positioning on the scale made it seem farther from 1.0 than it really is. Therefore, visually the rating of this ROV appeared worse than it actually is. One participant expressed this concern, "the graph is confusing. To me .81 is close to 1.0, but on the graph they are far apart, 0.7 means it just passed the standards." In addition, there was general

consensus among participants that the scale should be numbered from 1 to 10 in whole numbers, rather than using decimals. As one participant explained, “Decimals are confusing...”

### **Explanatory Text**

A majority of participants understood the information presented on the hangtag. However, several participants mentioned that the hangtag did not contain enough pertinent information in relation to the vehicle’s stability and that there was no mention of the source of this information. In general, participants wanted more information relating to rollover, such as the number of passengers in the vehicle, the speed of the vehicle, and the weather conditions used during assessment. Furthermore, they wanted to know exactly where the information came from, such as a government agency or manufacturer’s association.

### **Hangtag N**

Hangtag N was a horizontal 4 by 6 design that was presented to two focus groups, both of which were inexperienced user groups. A majority of the participants understood the general message conveyed by the hangtag. However, across both focus groups, participants provided more critical than positive feedback regarding hangtag N. The hangtag was largely identified as not being informative enough. Some participants indicated that the information on this hangtag is confusing.

There were two aspects of the hangtag that received positive feedback. The participants praised the use of the ‘Caution’ symbol in the heading panel. In addition, the participants provided positive evaluations of the location of the text “Compare with other vehicles before you buy.” Several participants explained that they liked the text more in this hangtag because it was clearer and had more of an impact. One participant explained, “[The hangtag is] effective because [the] ‘compare’ text is the last thing you read.”

### **Heading Panel**

This area of the hangtag received considerable positive feedback during the focus group discussion. Participants reported that the use of the caution symbol in the signal word panel was attention catching and was effective at communicating the hazard information regarding the ROV operation. It should be noted that these positive comments all came from the participants of the second focus group.

### **Scale/Graph**

Similar to the other hangtags, participants noted that the range of the scale used (0.7 to 1.0) and the use of decimals made the scale confusing and difficult to understand. One participant explained, “I would not understand the chart, [I would have to] ask the sales people to educate me on it.” Another person stated, “Graph is confusing, don’t like decimals. I don’t want to have to think about math.”

It is important to note that on this hangtag design, the scale was anchored on one side at the minimally acceptable value point. This aspect of the scale and marking of the minimally acceptable point received positive commentary from participants. Several participants described the minimally acceptable label as being clear and understandable. In addition, they liked the fact that the scale is starting at the minimal acceptable point, as one participant noted, “There is no point in having [the] graph started below [the] minimal rating.”

### **Explanatory Text**

The participants’ reaction to the explanatory text on hangtag N differed depending on the focus group to which it was presented. Among the participants of the first group, there was a general consensus that the hangtag does not provide enough information. One participant of the first group explained, “[The hangtag is] confusing because there is not enough information,” while another participant explained that the lack of

information leads the hangtag to be "...less interesting and effective." Some participants claimed that the information provided was not the information they wanted, and that they wanted to know some of the details behind the rollover ratings, such as speed and weather conditions. Additionally, participants expressed interest in having information on the source of the rollover resistance rating information, as one participant described the issue, "[There is] no criteria, no indication of where the information comes from."

Alternatively, the participants of the second group provided more positive commentary on the explanation provided on the Hangtag N. Although some of the participants indicated that the information on the hangtag is confusing, a few participants provided positive commentaries indicating that they understand the information. One participant in this group stated that the hangtag was "direct and simply informative." Others reported that the "Compare with other vehicles before you buy" statement is clearer than other versions."

The differences between these two focus groups may be explained by the fact that these groups received different sets of the hangtags. The first group received hangtags K, J, and N. In this set, hangtags J and K included much more explanatory text than hangtag N. Thus, in comparison to hangtags K and J, hangtag N may have appeared as not providing sufficient explanation.

### **Hangtag O**

Hangtag O was a horizontal 4-inch by 6-inch hangtag that was presented to two focus groups, one group of less experienced ROV users and another group of more experienced ROV users. Overall, the participants provided very positive feedback, primarily due to the color coded scale and the overall appearance of the hangtag. Despite the positive reaction to the appearance of the scale, participants indicated some difficulty understanding the information presented in the information panel.

#### **Heading Panel**

The heading panel received very little commentary from participants, as their attention was focused on the color coded scale. However, the heading panel generated some positive feedback. One of the participant indicated that she liked the pictorial presentation of the tilted car, because "...there is no person flying out."

#### **Scale/Graph**

Participant's reaction to the color coded scale was overwhelmingly positive with near universal approval of the color coding. A vast majority of participants stated that the color-coding made the scale very noticeable and aided in understanding the scale. Despite the support for color-coding of the scale, many participants still found the range of the scale confusing, indicating they would prefer to have the scale range from 0-10. One participant explained, "the color-coding is easy to understand, but the numbers were confusing, because it is not easy like [when it ranges from] 0-10."

Several participants did not notice the minimally acceptable mark at all, while others noticed it only after they were asked to identify the minimally acceptable rating. This indicates the marking with dotted line is not sufficiently evident. Furthermore, several participants noted that they did not like that the vehicle rating and the 'minimally acceptable' rating were marked in the same way, with dotted lines. One participant remarked, "That tiny dotted line is the minimum, but it's not too clear, because the vehicle rating is marked the same way."

#### **Explanatory Text**

Participants commented that the explanatory text contains too many words and is somewhat confusing. One participant stated, "[There is] a little too much to read at the bottom. [The] information is presented nicer in the graph, people don't like to read." In addition, participants noted that the hangtag does not provide the source of the information presented.

### **Hangtag M**

Hangtag M was a vertical 4 by 6 hangtag that was presented to two focus groups, one group of less experienced ROV users and another group of more experienced ROV users. Hangtag M received highly mixed ratings from focus group participants. Some participants considered the hangtag confusing, “the whole thing is confusing,” while others thought that it was simple to understand, “it is believable and more understandable.” A large majority of this disagreement relates to the rating of the vehicle presented in hangtag M. Due to its simplicity, some participants found the single digit rating easy to understand while others felt that it was too simple and did not provide enough information. Similar to feedback provided on other hangtags, a majority of participants stated that they would like to know the source of the information on rollover resistance rating.

#### **Heading Panel**

A majority of participants agreed that the signal panel was noticeable, due to the bold lettering and yellow background of the signal panel. However, a few different opinions arose with regard to the effectiveness of the pictorial symbol. One participant explained that she thought the pictorial symbol was illustrating a pedestrian being struck by the ROV, rather than it being the driver being thrown from the vehicle. Conversely, another participant felt that it was not only obvious that it was the driver being thrown from the vehicle, but that the graphic made the tag more noticeable and effective.

#### **Scale/Graph**

Participant’s opinions on the simple numeric rating presented in hangtag M varied considerably. Some participants found the scale simple and easy to read and understand, while others were confused because it did not present enough information. Some participants argued that the information is insufficient because it “does not tell you the criteria” while others explained that it “can help you compare with other vehicles, [you] want a higher rating even if you don’t know that much about the background.” Therefore, there were different impressions of the resistance rating being presented as a simple numeric value for this vehicle.

#### **Explanatory Text**

Several participants agreed that because the information presented in the hangtag was not referenced, the credibility of the message is affected. Several participants indicated that the resistance rating was unclear without reading the text presented in the information panel. Furthermore, a few participants explained that the text in the information panel was too small, making it somewhat difficult to read.

### **Hangtag L**

Hangtag L was a vertical 5 by 7 hangtag that was presented to two focus groups, both of which were less experienced user groups. Overall, participants gave positive feedback on this hangtag. In particular, participants were in favor of the overall appearance of the hangtag, they liked the title “Rollover Risk” because they considered it “a more understandable term” that the “resistance rating” used on other hangtag versions. In addition, they liked the appearance of the scale. Based on participant comments during the group discussion and the impressions they reported independently, the scale on hangtag L was the least confusing of all the hangtags. One participant described the tag as “big, easy to read, [and] simplified.”

#### **Heading Panel**

A majority of participants expressed that hangtag L was attention catching, due to the color and use of bold lettering. Additionally, the language used in the heading panel (Rollover Risk versus Rollover Resistance) was well regarded across both focus groups, “risk language is easier to understand.” One participant described their initial reaction to the hangtag by stating that the tag is “very attention grabbing, [with] big, bold lettering and color.” Another participant stated it was “Very visual, [and] the language is easier to understand.”

### **Scale/Graph**

A majority of participants indicated that the scale was “easier to understand because [the scale values ranged] from 0-10.” Participants considered a scale ranging from 0-10 easier to understand regardless of whether higher numbers represented a positive or negative indicator. Some participants in the second group expressed a preference for higher values equating to safer or better ROVs. One participant explained that on hangtag L “[A] high rating looks good, [but] after reading, [you realize that] it is not good.”

### **Explanatory Text**

During individual evaluations the participants did not indicate any confusion with the hangtag or the explanatory text. However, during the discussion some participants commented that the explanatory text is confusing. Participants stated they expected the higher numbers to be indicative of better ROVs. It is possible that participants were primed by the direction of the scale in all the other hangtags, which presented a scale in which a higher value indicated a better rating, or higher stability. Therefore, the confusion with regard to the direction of the scale in hangtag L may have been influenced by the way information was presented on all the other hangtags. In general, however, participants liked that the information presented on hangtag L was in short and simple sentences.

### **Hangtag J**

Hangtag J was a vertical 5 by 7 hangtag presented to two focus groups, one group of less experienced ROV users and another group of more experienced ROV users. Participants’ reactions to hangtag J were mixed. About half of the participants understood that hangtag J was warning them about potential safety issues, while others thought the hangtag consisted of promotional material from the manufacturer to be used to advertise their vehicle’s resistance to rolling over. One participant expressed this confusion, “I am not sure if it is for marketing or safety. I think it is about pedestrian safety. Also the angle is confusing, I mean what is 33 degrees?” Therefore, there was some confusion regarding the general purpose of the hangtag.

In particular, the confusion seemed to stem from participants having difficulty understanding the information presented by the measured angle of lateral stability. Furthermore, participants were also confused by the text presented in the information panel at the bottom of the tag. Both the more experienced and less experienced groups expressed considerable difficulty understanding the information presented on the hang tag. The most frequent complaint about the overall hangtag was that it was too wordy, terminology and technical language was difficult to understand, and it did not include enough visual aids to make it easier to understand.

### **Heading Panel**

In general, participants reported that the hangtag was eye-catching, referencing two aspects in particular: the large, bold, yellow “Rollover Resistance,” and the figure being thrown from the car. Although the stick figure appeared to be attention grabbing, “my eyes are drawn to the figure falling out of the car,” it also seemed to introduce some confusion because the image appeared to be unrealistic, “I understand tipping over, but if you have a seat belt you will not get ejected, so that is confusing.”

### **Scale/Graph**

The measure of ROV rollover resistance on hangtag J was the most confusing and disliked aspect of hangtag J across both more experienced and less experienced ROV user groups. The most frequent complaint was that the measurement was highly difficult to translate into real world usage of an ROV. This sentiment was expressed by four participants during the discussion, with one participant stating, “It is hard [to understand] because I don’t know what the angle measurement is in real life.” Another participant commented, “How do I know the angle I am at, and about 4 wheels on the ground.” One participant also found the supplementary information text to be confusing stating, “[The] Tilt table test is confusing, it makes my head hurt.”

### Explanatory Text

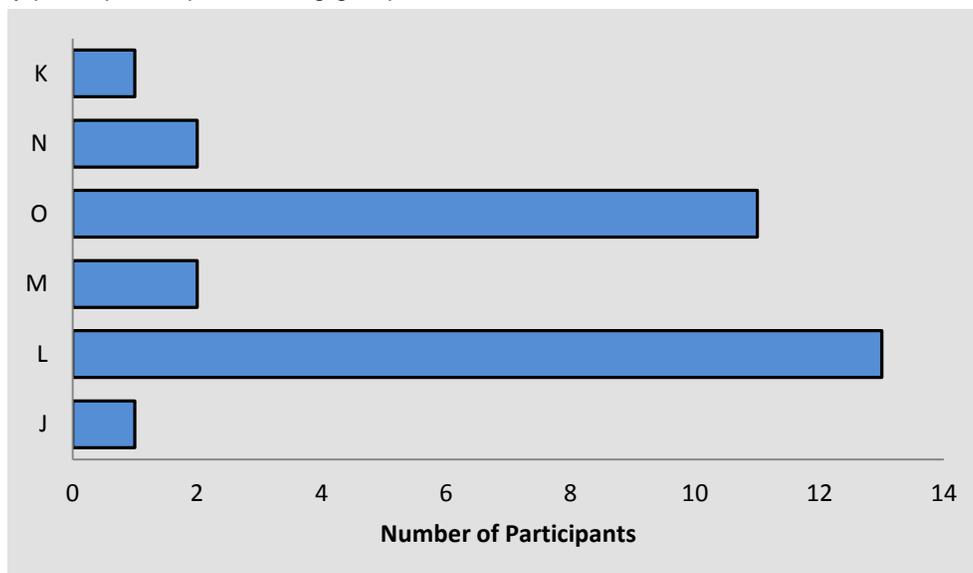
A vast majority of participants indicated that the language used in hangtag J on the information panel was confusing and that the tag did not include enough visuals, one participant explained, “It is [written in] engineer lingo, you need more information to understand it.”

### Hangtag Design Comparison

Participants were asked to evaluate and compare the different hangtag options independently at the beginning of the focus groups, before the discussion. They were asked to rate different aspects of the hangtags (i.e. scale, signal panel, etc.) and then to compare and choose their preferred designs based on two different criteria: hangtag message understandability and message effectiveness in motivating consumers to compare vehicles before buying. Participants were also probed to provide an explanation for their preferences. In addition, participants were asked to indicate on each tag if there were aspects of the tag they considered confusing or that they disliked. The following section provides a summary of the participants comparisons across all hangtag design evaluated in second round.

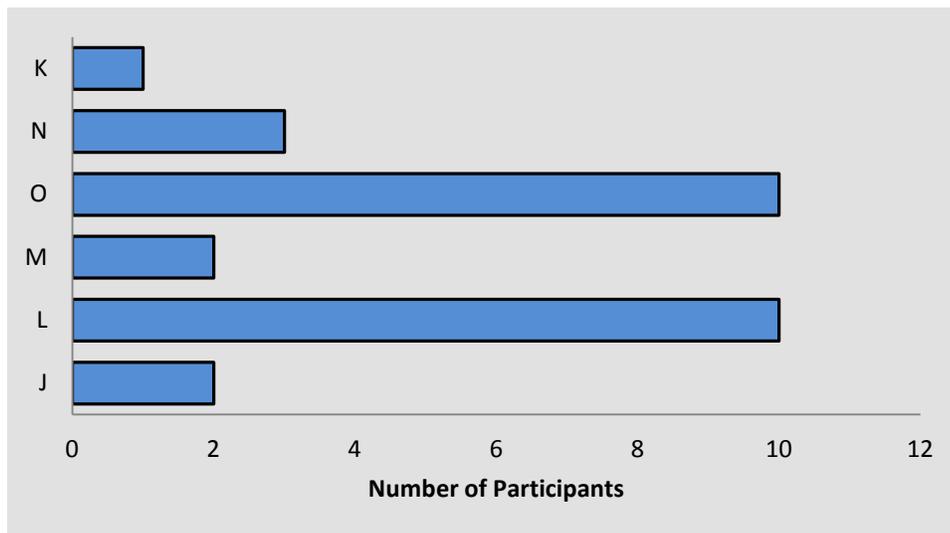
### Overall Results

During the independent evaluation of the hangtags, participants were asked, “Which of the label messages is easiest to understand?” Of the six hangtag designs, the message on hangtag L was “easiest to understand.” Hangtag L was followed by hangtag O in terms of understandability. These findings were generally supported by participant reports during group discussions.



**Figure 7. Hangtag Message Understandability**

Participants were also asked, “Which one of the labels do you think would be most effective for motivating customers to compare the vehicles before making a purchasing decision?” As shown in Figure 8, two thirds of the participants (20 out of 30) considered hangtags L and O to be the most, and equally, effective in motivating customers to compare between different ROVs before they make a purchasing decision.



**Figure 8. Hangtag Effectiveness in Motivating Customers to Compare between ROVs**

### Heading Panel

Hangtag designs O, M and J had the highest number of negative comments regarding the Heading Panel. Although all three tags were titled “Rollover Resistance,” a few other tags that were liked were also titled “Rollover Resistance.” Thus, the results regarding the title of the tag seem inconclusive when based solely on these reports. However, during group discussions, participants demonstrated a clear preference for the title used in hangtag L, “Rollover Risk.” Participants reported finding the language simpler and more pertinent than “Rollover Resistance.” One participant explained that she preferred the ‘risk’ language, because “[Risk] is easier to explain to kids, risk is a more understandable term.”

The pictorial symbol across the three most disliked hangtags, O, M and J, also varied considerably. One tag only included a picture of the tilted ROV, another was a tilted ROV with a stick figure flying out and the third also included a stick figure flying out of the ROV but with an angle measure below the ROV. Therefore, it is difficult to draw any conclusions about the least preferred pictorial symbol based on these results. However, during the focus group discussion, participants expressed an overall preference for a pictorial symbol of just a tilted ROV rather than including a stick figure flying out of the car. There were two main reasons participants did not seem to like the use of the stick figure. First, the image was unclear, “it grabbed my attention, but it looks like the person got hit by the car.” Second, it seemed inaccurate because a person would not fly out of the car if a seat belt was being used, “I understand tipping over, but if you have a seat belt on [then] you won’t get ejected, so that is confusing.”

### Scale/Graph

Based on the number of dislikes and confusion indicated on the scale/graph of each hangtag, the least confusing and most liked design is hangtag L. There were a total of four indicators of confusion/dislike regarding hangtag L, while all other hangtags had received either eight or nine reports of dislike or confusion. Based on the group discussions, the main reason the hangtag L scale was liked most is because it presented a scale with the range of numbers from 0 to 10 and used the whole numbers rather than decimals to denote the scale. Across all groups there was general consensus that that the scale should use whole numbers, since the numbers with decimals are more difficult to understand and compare, “the graph is

confusing, don't like decimals. I don't want to have to think about math." In addition, participants criticized other hangtags with the scale for not displaying the whole range of possible values, but only from just below the minimal acceptable value (0.7) to 1, which seemed a misleading approach. Furthermore, participants preferred hangtags that presented rollover resistance values on a scale as opposed to just the single rating or value.

### **Explanatory Text**

The number of reported dislikes and confusion regarding any aspect of the information panel were analyzed. Results showed that information panels in hangtags J and K were the most confusing and/or disliked among all the hangtags, with ten and thirteen participants indicating dislike/confusion, respectively. These two hangtags also had a lot of text compared to some of the other hangtags. Although there was a consistent dislike of overly "wordy" text across all groups, the participants' attitude about the amount of the text on the hangtag somewhat depended on what set of the hangtags they received. Those groups that had hangtag K or J in their set, even if they complained about too much text, still expected more explanatory text on other hangtags. Participants that did not have hangtag K or J in the set did not comment about other hangtags not having sufficient information or explanation presented. However, participants expressed the need to know the source of the information presented on the hangtags consistently across all groups.

Although hangtag N received zero negative indicators, it was, on the whole, unpopular with participants across all focus groups during group discussions. Hangtag N was also the hangtag that consisted of very little text and had the least amount of information presented in the information panel. Furthermore, hangtag O received the second fewest numbers of dislike/confusion, with just four participants indicating dislike or confusion. Therefore, there was some conflicting data regarding what the participants prefer to be presented with (more text in the information panel) compared to what participants report as more liked and less confusing (hangtags with less text in the information panel).

## **4.2. Final Design Recommendations**

The general impression gathered from the discussions with participants shows that the graphs/scales and the explanatory text were the areas that caused the most confusion and comprehension difficulties across all the hangtag designs. Although the scales were generally informative, participants concluded that certain aspects of the various scales they saw were confusing and needed to be simplified. Specifically, participants found decimals more confusing than using whole numbers, and they preferred the scales range from 0-10.

Although the text provided below the scale within the message panel provided useful information, there was general consensus that the terminology needed to be simplified because it was too technical and difficult to understand. In addition, there was a lot of confusion among participants regarding the source of the information presented in the scales, specifically, but also in the whole hangtag, with a majority opining they wanted to know who did the testing. Furthermore, both experienced and less experienced ROV users had considerable difficulty understanding or explaining the technical terms used in Hangtag J, but felt that others, such as hangtag M and N, had been too simplified. The vast majority of participants agreed that the inclusion of an informational resource from which to procure more detailed information was a good way to balance the information provided (being too complex versus not having enough details).

The most preferred hangtag overall, based on general appearance and understanding, was hangtag L. Participant's reactions during the focus group discussion were most positive regarding hangtag L, and the amount of confusion and dislike overall was reported as lowest for hangtag L. Participants decided that this hangtag was the easiest to understand and most effective in motivating customers to compare ROVs. The streamlined scale presented on hangtag L was deemed to be highly understandable. Hangtag O was identified as the second easiest to understand and effective in communicating intended information.

Specifically, participants found the color coded scale presented in hangtag O to be simple to understand and highly visual. While participants found the angle measurement and textual information presented in hangtag J confusing and too technical, many did state that the use of the 'Caution' symbol in the text did a good job of drawing their attention to information describing how to minimize rollover incidents.

Participants' suggestions for improvement were focused mostly on alterations to the scale of the hangtag and the text presented in the bottom portion of the hangtag. Participants were largely split over whether the inclusion of a "stick" figure to the icon of the tipping ROV was helpful or not, but overall the stick figure seemed to introduce more confusion in understanding the pictorial symbol.

### ***Heading Panel***

Participants indicated that they liked the whole hangtag to be yellow because it is most effective in capturing attention. Participants experienced and/or expressed some confusion regarding the title "Rollover Resistance," and some participants indicated that that term is difficult to understand. One of the participants stated, "Rollover resistance is confusing, maybe it could say [rollover] hazard..." Another indicated that "[rollover] resistance is like a sales tool, risk is more informational." Since the term "rollover resistance" was confusing and the purpose of the hangtag is to provide information not to warn against the risk, we recommend changing the heading of the hangtag to "Rollover Guide."

### ***Message Panel Description***

According to the feedback obtained from the focus groups, the most preferred and easy to understand scale format was used in hangtag L. Additionally, hangtag L scored the lowest in terms of confusion, making it the easiest to understand and the least confusing out of the six hangtags tested. Furthermore, participants came to a general consensus that ratings presented with whole numbers and ranging from 0-10 are easier to understand. As a result, we propose using a hangtag that presents the vehicle's rating on a scale ranging from 0-10 and the scale should be entitled as "Rollover Rating." We recommend that higher numbers on the scale should indicate a higher tendency for rollover, that is, the scale should present a direct relationship between the rollover rating and tendency to rollover. Otherwise, consumers would have to conduct a mental operation of inversion in order to realize that models with higher numbers have smaller tendency to rollover as is the case with the hangtags using "rollover resistance" terminology, which led to a lot of confusion and misunderstanding among study participants.

There were only minimal issues with placement and/or understanding the information regarding the make and model of the ROV. However, in order to ensure understanding that the hangtag presents the rollover rating for the indicated make and model of ROV, we recommend placing the information on the make and model of the ROV immediately below the scale title "Rollover Rating." This approach will ensure association between the rating and *the presented* make and model of ROV.

Within the second portion of the message panel, we recommend providing supplemental information on ROV rollover, including the following:

- Information on the scale range and explanation of the rollover rating;
- Explanation about how the rollover hazard is determined; and
- Information on the resources that provide additional and more extensive explanation of the rollover rating measurement.

Since difficulty understanding complex engineering information presented on the hangtags was the major concern expressed across all the groups and different level of experience with ROV, we strongly recommend that the technical information is presented in plain, easily understood terms.

### ***Pictorial Symbol***

As mentioned previously, including a pictorial symbol in the label increases its salience and the overall likelihood that the label will be noticed. However, along with presenting a pictorial symbol, it is especially important the consumer understands the symbol presented and that the intended meaning is conveyed. Generally, participants liked the image of an ROV tipping over and they understood the intent of the image. There were a few concerns that arose as a result of including a stick figure flying out of the ROV. First, participants felt that this image was unrealistic because a person would have a seatbelt on and therefore not likely to be ejected from the vehicle. Second, some participants were unsure what the image was trying to depict because it appeared to them as if a person was being hit by an ROV. Therefore, we recommend removing the person flying out of the vehicle and including a pictorial symbol of only a tipped ROV in the final version of the hangtag.

### ***Size and Orientation***

Two different hangtag sizes (5-inch by 7-inch and 4-inch by 6-inch) and two different orientations (horizontal and vertical) were tested. Participants preferred the larger hangtag (5-inch by 7-inch) because the text size was easier to read and the tag was more noticeable. In addition, participants preferred a vertical version of the hangtag. Therefore, we recommend that the hangtag adopt a vertical orientation with a 5-inch by 7-inch size.