United States
Consumer Product Safety Commission
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The contents of this document will be discussed at the Commission Meeting scheduled for May 25, 2022.

This document has been electronically approved and signed.

THIS MATTER IS NOT SCHEDULED FOR A BALLOT VOTE

A DECISIONAL MEETING FOR THIS MATTER IS SCHEDULED ON: TBD

TO: The Commission
Alberta E. Mills, Secretary

DATE: May 18, 2022

THROUGH: Austin C. Schlick, General Counsel
Mary T. Boyle, Executive Director

FROM: Daniel R. Vice, Assistant General Counsel, Regulatory Affairs
Barbara E. Little, Attorney, Regulatory Affairs

SUBJECT: Notice of Proposed Rulemaking: Safety Standard for Recreational Off-Highway Vehicle and Utility Task/Terrain Vehicle Debris Penetration Hazards

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Staff is forwarding to the Commission a briefing package recommending that the Commission issue a notice of proposed rulemaking (NPR), pursuant to sections 7 and 9 of the Consumer Product Safety Act, to address the risk of debris penetration associated with Recreational Off-Highway Vehicles (ROVs) and Utility Task/Terrain Vehicles (UTVs). The Office of the General Counsel is providing for the Commission's consideration a draft NPR that would establish a requirement to address debris penetration in ROVs and UTVs.

Please indicate your vote on the following options:

I. Approve publication of the attached notice in the *Federal Register,* as drafted.

______________________________ ______________________
(Signature) (Date)

II. Approve publication of the attached notice in the *Federal Register,* with specified changes.

______________________________ ______________________
(Signature) (Date)

III. Do not approve publication of the attached notice in the *Federal Register.*

(Signature) (Date)

IV. Take other action specified below.

(Signature) (Date)

Attachment: Draft *Federal Register* Notice of Proposed Rulemaking: Safety Standard for Debris Penetration Hazards

Billing Code 6355-01-P

CONSUMER PRODUCT SAFETY COMMISSION

16 CFR Part 1421

[CPSC Docket No. CPSC–2021-0014]

Safety Standard for Debris Penetration Hazards

AGENCY: Consumer Product Safety Commission

ACTION: Notice of proposed rulemaking; notice of opportunity for oral presentation of comments.

SUMMARY: The U.S. Consumer Product Safety Commission (Commission or CPSC) has determined preliminarily that there is an unreasonable risk of injury and death associated with debris penetration in off-highway vehicles (OHVs), including recreational off-highway vehicles (ROVs) and utility task/terrain vehicles (UTVs). To address these risks, the Commission proposes a rule to prevent debris penetration into the occupant area of an ROV/UTV.

The Commission is providing an opportunity for interested parties to present written and oral comments on this notice of proposed rulemaking (NPR). Like written comments, any oral comments will be part of the rulemaking record.

DATES: Deadline for Written Comments: Written comments must be received by [INSERT DATE THAT IS 60 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER].

Deadline for Request to Present Oral Comments: Any person interested in making an oral presentation must send an electronic mail (e-mail) indicating this intent to the Division of the Secretariat at cpsc-os@cpsc.gov by [INSERT DATE THAT IS 30 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER].

ADDRESSES: Written Comments: You may submit written comments in response to the proposed rule, identified by Docket No. CPSC–2021-0014, by any of the following methods:

Electronic Submissions: Submit electronic comments to the Federal eRulemaking Portal at: https://www.regulations.gov. Follow the instructions for submitting comments. CPSC typically does not accept comments submitted by e-mail, except as described below. CPSC encourages you to submit electronic comments by using the Federal eRulemaking Portal, as described above.

Mail/hand delivery/courier Written Submissions: Submit comments by mail/hand delivery/courier to: Division of the Secretariat, Consumer Product Safety Commission, 4330 East West Highway, Bethesda, MD 20814; telephone: (301) 504-7479. If you wish to submit confidential business information, trade secret information, or other sensitive or protected information that you do not want to be available to the public, you may submit such comments by mail, hand delivery, or courier, or you may e-mail them to: cpsc-os@cpsc.gov.

Instructions: All submissions must include the agency name and docket number. CPSC may post all comments without change, including any personal identifiers, contact information, or other personal information provided, to: https://www.regulations.gov. Do not submit through this website: confidential business information, trade secret information, or other sensitive or protected information that you do not want to be available to the public. If you wish to submit such information, please submit it according to the instructions for mail/hand delivery/courier/confidential written submissions.

Docket for NPR: For access to the docket to read background documents or comments received, go to: https://www.regulations.gov, and insert the docket number, CPSC–2021-0014, into the “Search” box, and follow the prompts.

FOR FURTHER INFORMATION CONTACT: Han Lim, Directorate for Engineering Sciences, Office of Hazard Identification and Reduction, Consumer Product Safety Commission, National Product Testing and Evaluation Center, 5 Research Place, Rockville, MD 20850; telephone: 301-987-2327; hlim@cpsc.gov.

SUPPLEMENTARY INFORMATION:

I. Background

On May 11, 2021, the Commission published an advance notice of proposed rulemaking (ANPR) to develop a rule to address the risk of injury associated with fire and debris penetration hazards in off-highway vehicles (OHVs) (86 FR 25817).[1] The vehicles comprising OHVs in the ANPR were all-terrain vehicles (ATVs), recreational off-highway vehicles (ROVs), and utility terrain or utility task vehicles (UTVs). The Commission received 10 comments. This notice of proposed rulemaking focuses solely on debris penetration hazards, which are specific to ROVs and UTVs. Debris penetration through the floorboard or wheel well of an ROV or UTV can impale the occupants of the vehicles, and incidents associated with debris penetration have caused severe injuries and deaths. The information discussed in this preamble is derived from CPSC staff's briefing package for the NPR, which is available on CPSC's web site at: [INSERT LINK].

II. Statutory Authority

This rulemaking addressing the debris penetration hazards associated with ROVs and UTVs falls under the authority of the CPSA. 15 U.S.C. 2051-2084. Section 7(a) of the CPSA

[1] At the ANPR stage, the Commission noted that although at that time the rulemaking involved three vehicle types and two different hazard patterns, it was possible that the Commission would divide the proceeding into separate rulemakings at the NPR stage. This proposed rule will address the debris penetration hazard associated with ROVs and UTVs. The Commission intends to address fire hazards associated with ATVs, ROVs, and UTVs in a separate rulemaking.

authorizes the Commission to promulgate a mandatory consumer product safety standard that sets forth performance or labeling requirements for a consumer product, if such requirements are reasonably necessary to prevent or reduce an unreasonable risk of injury. 15 U.S.C. 2056(a). Section 9 of the CPSA specifies the procedure that the Commission must follow to issue a consumer product safety standard under section 7 of the CPSA. In accordance with section 9, the Commission commenced this rulemaking by issuing an ANPR.

According to section 9(f)(1) of the CPSA, before promulgating a consumer product safety rule, the Commission must consider, and make appropriate findings to be included in the rule, on the following issues:

- The degree and nature of the risk of injury that the rule is designed to eliminate or reduce;
- The approximate number of consumer products subject to the rule;
- The need of the public for the products subject to the rule and the probable effect the rule will have on utility, cost, or availability of such products; and
- The means to achieve the objective of the rule while minimizing adverse effects on competition, manufacturing, and commercial practices.

Id. 2058(f)(1).

Under section 9(f)(3) of the CPSA, to issue a final rule, the Commission must find that the rule is "reasonably necessary to eliminate or reduce an unreasonable risk of injury associated with such product" and that issuing the rule is in the public interest. *Id.* 2058(f)(3)(A)&(B). Additionally, if a voluntary standard addressing the risk of injury has been adopted and implemented, the Commission must find that:

- The voluntary standard is not likely to eliminate or adequately reduce the risk of injury, *or*

- Substantial compliance with the voluntary standard is unlikely.

Id. 2058(f)(3)(D). The Commission also must find that expected benefits of the rule bear a reasonable relationship to its costs and that the rule imposes the least burdensome requirements that would adequately reduce the risk of injury. *Id.* 2058(f)(3)(E)&(F).

II. The Products

A. ROV

An ROV is a motorized vehicle designed for off-highway use, with these features: four or more wheels with tires designed for off-highway use; non-straddle seating for one or more occupants; a steering wheel for steering controls; foot controls for throttle and braking; and a maximum vehicle speed greater than 30 miles per hour (mph). ROVs are typically equipped with Rollover Protective Structures (ROPS), seat belts, and other restraints, such as doors, nets, and shoulder bolsters for the protection of occupants.

There are two distinct ROV varieties: utility-type ROVs and recreational-type ROVs. Models emphasizing utility have larger cargo beds, greater cargo capacities, and lower top speeds. Models emphasizing recreation have smaller cargo beds, lower cargo capacities, and higher top speeds. Both types of ROVs are included in the scope of the proposed rule.

At least one ROV manufacturer offers youth-oriented ROVs, which are smaller versions of the full-size ROVs. These youth-oriented ROVs have smaller diameter tires, lower ground clearance, and less suspension travel; therefore, there is less exposed space in the front wheel well area for a branch to thread between the steering/suspension components and the wheel to penetrate the occupant compartment. Given the low ground clearance and wheel-well configuration of youth-ROVs, as well as the lack of debris penetration incident data involving these vehicles, youth ROVs are not included in the scope of the proposed rule.

B. UTVs

UTVs have physical characteristics like ROVs. However, UTVs generally have maximum speeds between 25 and 30 mph. UTVs are included in the scope of the proposed rule. Figure 1 shows a picture of typical Utility-Type ROV, a Recreational-Type ROV, and a UTV.

Figure 1. Left to Right: Typical Utility-Type ROV, Typical Recreational-Type ROV, and Typical UTV

III. Risk of Injury

A. Description of Hazard

ROVs and UTVs are intended to be driven off-highway and have all-terrain capabilities; typical uses include farm work, hunting, recreation, trail riding, and competitive racing. These vehicles are often driven in wooded areas or trails, where the vehicles can be expected regularly to be driven over tree branches and sticks.

Debris penetration involves debris (usually a tree branch or stick) cracking or penetrating the occupant area of an ROV or UTV. Debris penetration hazards are a comparatively greater concern for ROVs and UTVs because the wheel-well areas on these vehicles are generally larger and more open, compared to those of ATVs. In incidents, the debris usually cracks or penetrates through the floorboard of the underside of the ROV or UTV. When such penetration occurs, there is a potential for the branch or other debris to penetrate far enough into vehicle to harm occupants of the vehicle. As described in Section III.B of this preamble, debris penetration can occur even when the vehicle is being driven at low speeds.

B. Incident Data

1. Debris Penetration Recalls

There have been three debris penetration recalls, all associated with ROVs. CPSC recall data include the number of affected vehicles, number of incidents, and injuries associated with the recalls. ROV manufacturers generated the recall data; although there may be some overlap in the incidents, the ROV manufacturer data is separate and distinct from the data associated with CPSC Epidemiology staff's injury and death analyses in Section III.B of this preamble, and the data associated with the Engineering Sciences assessment, in Section IV.A of this preamble.

Collectively, over the period from 2014 through 2016, these three recalls consisted of approximately 55,000 recalled vehicles, 630 incidents of debris cracking or breaking through the floorboards, and 10 injuries. There were no deaths associated with ROV debris penetration hazards among these recalls.

2. National Electronic Injury Surveillance System (NEISS) and CPSC's Consumer Product Safety Risk Management System (CPSRMS) Data

CPSC Epidemiology staff reviewed NEISS injury cases and CPSRMS injury cases that occurred in the period from 2009 to 2021. Staff searched for debris penetration incidents involving ATVs, ROVs, and UTVs.

None of the debris penetration incidents involved an ATV (other than an ROV mischaracterized as an ATV). Given that ATVs do not have floorboards, the lack of debris penetration incidents involving ATVs was not unexpected. Because of this, ATVs are not included within the scope of the proposed rule.

Between 2009 and 2021, there were a total of 107 incidents found in CPSC databases involving debris penetration hazards; 104 of these incidents were found in CPSRMS, and 3 injury cases were found in NEISS. A previous search conducted for the ANPR, completed in spring 2021, returned 105 total incidents involving debris penetration hazards, consisting of 103 CPSRMS incidents and 2 NEISS injury cases.

Due to the small sample size of NEISS injury data, staff cannot estimate injuries.[2] Instead, for the debris penetration hazard scenario, staff counted the three injuries from NEISS with the other reported injuries from CPSRMS. Table 1 shows the yearly breakout of debris penetration hazards by data sources and severity of incidents.

Table 1: Reported Incidents of OHV Debris Penetration Hazards by Year (CPSRMS: 2009-2021, NEISS: 2009-2020)

Year	Total Incidents Reviewed	Fatal Reported Incidents	Injury Reported Incidents	Non-Injury Incidents
Total	**107**	**6**	**22**	**79**
2009	1	0	1	0
2010	4	1	1	2
2011	3	0	1	2
2012	7	0	0	7
2013	8	0	2	6
2014	11	1	1	9
2015	8	1	3	4
2016	30	0	5	25
2017	27	2	2	23
2018	5	0	4	1
2019*	2	1	1	0
2020*	0	0	0	0
2021*	1	0	1	0

Sources: CPSRMS and NEISS.
*Data collection is ongoing.

Many of the 104 debris penetration incidents found in CPSRMS include multiple people riding in the OHV. However, for reports involving nonfatal injuries, only the age and/or gender of one or two of the victims is recorded. In reports received from manufacturers and retailers, which largely consist of non-injury incidents, basic victim demographic information is frequently not included at all.

Table 2 presents a broad overview of the distribution of the 107 debris penetration incidents by primary victims' age and gender. Forty-four of the 47 incidents with victim age missing are non-injury incidents; all 36 incidents with both victim age and gender missing are non-injury incidents as well.

Table 2: Reported Incidents of Debris Penetration Hazards by Age and Gender

	Female	Male	Gender Missing	Total
0 – 17 years	2	6	0	**8**
18 – 34 years	4	11	0	**15**
35 – 54 years	9	17	0	**26**
55+ years	0	11	0	**11**
Age Missing	1	10	36	**47**
Total	**16**	**55**	**36**	**107**

Sources: CPSRMS and NEISS.

CPSC field staff conducted in-depth investigations on the six fatal incidents. In all six fatal incidents, only one victim per incident died, as opposed to multiple fatalities per incident. Two incidents involved the death of a passenger, while the other four involved the death of the driver. Four involved a tree branch, one a large stick, and one a 2- to 3-inch piece of wood. At least three involved penetration of an occupant's chest.

The severity of the 22 nonfatal injury incidents due to debris penetration is presented in Table 3. The injuries ranged from mostly minor cuts, bruises and/or abrasions, to more severe injuries, like broken bones or debris impalement in the body. Most of the nonfatal injuries occurred in the lower area of the body (*e.g.*, ankles, legs, foot) or abdomen.

Table 3: Reported Incidents of Debris Penetration Hazards by Injury Severity (2009-2020 NEISS, 2009-2021 CPSRMS)

Injury Severity	Incidents
Treated and Released, or Released without Treatment	2
Hospital Admission	4
Emergency Department Treatment Received	3
First Aid Received by Non-Medical Professional	1
No First Aid or Medical Attention Received	2
Level of care not known	10
Total Injury Incidents	22

Source: CPSRMS and NEISS.

IV. Relevant Existing Standards

There are two voluntary standards associated with ROVs and UTVs: ANSI/ROHVA 1, *American National Standard for Recreational Off-Highway Vehicles*, and ANSI/OPEI B71.9, *American National Standard for Multipurpose Off-Highway Utility Vehicles.* A description of each standard follows.

A. ANSI/ROHVA 1 *American National Standard for Recreational Off-Highway Vehicles*

The Recreational Off-Highway Vehicle Association (ROHVA) developed ANSI/ROHVA-1 American National Standard for Recreational Off-Highway Vehicles, which sets mechanical and performance requirements for ROVs. The most recent version of ANSI/ROHVA-1 was published in 2016. The ANSI/ROHVA-1-2016 standard defines an "ROV" as a motorized off-highway vehicle designed to travel on four or more tires, intended by the manufacturer for recreational use by one or more persons and having the following characteristics:

- A steering wheel for steering control;
- Foot controls for throttle and service brake;

- Non-straddle seating;
- Maximum speed capability greater than 30 MPH;
- Gross Vehicle Weight Rating (GVWR) no greater than 1700 kg (3750 lbs);
- Less than 2030 mm (80 in) in overall width;
- Engine displacement equal to or less than 1,000 cc for gasoline fueled engines;
- Identification by means of a 17-character PIN or VIN.

The standard addresses design, configuration, and performance aspects of ROVs, including requirements for accelerator and brake controls; service and parking brake/parking mechanism performance; lateral and pitch stability; lighting; tires; handholds; occupant protection; labels; and owner's manuals. The latest version of the standard adds vehicle handling requirements and enhanced seat belt reminder requirements to address rollover and occupant ejection hazards associated with ROVs. ANSI/ROHVA 1-2016 does not have requirements to address debris penetration into the occupant area of the vehicle.

ROHVA member companies include Textron (formerly known as Arctic Cat), Bombardier Recreational Products (BRP), Honda, John Deere, Kawasaki, Polaris, and Yamaha. Work on ANSI/ROHVA-1 started in 2008; work was completed with publication of ANSI/ROHVA 1-2010. The standard was immediately opened for revision, and a revised standard, ANSI/ROHVA 1-2011, published in July 2011. The most recent version was published in 2016.

B. ANSI/OPEI B71.9 *American National Standard for Multipurpose Off-Highway Utility Vehicles*

Some ROV manufacturers that emphasize the utility applications of their vehicles worked with the Outdoor Power Equipment Institute (OPEI) to develop ANSI/OPEI B71.9 American National Standard for Multipurpose Off-Highway Utility Vehicles. The most recent edition of the OPEI standard was published in 2016. ANSI/OPEI B71.9 defines a "multipurpose off-highway utility vehicle" (MOHUV) as a vehicle having features specifically intended for utility use and having these characteristics:

- Intended for transport of one or more persons and/or cargo, with a top speed in excess of more than of 25 mph;
- Overall width of 2030 mm (80 in) or less;
- Designed to travel on four or more wheels, two or four tracks, or combinations of four or more wheels and tracks;
- Use of a steering wheel for steering control;
- Equipped with a non-straddle seat;
- Gross Vehicle Weight Rating of no more than 1814 kg (4000 lbs.); and
- Minimum cargo capacity of 159 kg (350 lbs.).

The Commission considers MOHUVs with maximum speed capabilities between 25 and 30 mph to be "UTVs." The Commission considers MOHUVs with maximum speed capabilities greater than 30 mph to be ROVs. The OPEI standard includes requirements for accelerator and brake controls; service and parking brake/parking mechanism performance; lateral and pitch stability; lighting; tires; handholds; occupant protection; labels; and owner's manuals. The latest version of the OPEI standard added vehicle handling requirements and enhanced seat belt reminder requirements (that are identical to the requirements in ANSI/ROHVA 1-2016) for vehicles with maximum speeds greater than 30 mph to address rollover and occupant ejection hazards associated with ROVs. ANSI/OPEI B71.9-2016 does not have requirements to address debris penetration into the occupant area of the vehicle.

OPEI member companies include Honda, John Deere, Kawasaki, and Yamaha. Work on ANSI/OPEI B71.9 was started in 2008, and it was completed with the publication of ANSI/OPEI B71.9-2012 in March 2012. The most recent version was published in 2016.

C. CPSC Staff Voluntary Standard Activity

In a September 2018 meeting with ROHVA and OPEI, CPSC staff discussed the largest of the ROV debris penetration recalls involving 628 manufacturer reports of debris cracking or penetrating through the floorboards and 8 injuries. Staff recommended that OPEI and ROVHA form task groups to study the ROV debris penetration issue. In subsequent meetings, CPSC staff discussed the debris penetration hazard recalls and redacted debris penetration in-depth investigation (IDI) reports with ROHVA and OPEI. At the most recent meeting on April 1, 2022, OPEI and ROHVA members shared exploratory work on test methods to evaluation debris penetration hazards and expressed an interest in collaborating with CPSC staff on the issue. The voluntary standard activity is ongoing; however, there are currently no ballots that address the debris penetration hazard or timetable from either organization.

V. CPSC and SEA Technical Analysis

A. CPSC Staff Analysis of IDIs

Engineering Sciences staff examined 53 IDIs,[2] which included the 8 IDIs examined in detail in the ANPR and 45 IDIs examined post ANPR. Many IDIs contained information for the estimated vehicle speed at the time of the accident, the estimated stick diameter, and information regarding the occupants' seatbelt usage.[3]

[2] Out of the 107 incidents, 53 incidents had corresponding in-depth-investigations IDIs.
[3] "Table 1 – Debris Penetration IDI Summaries," in section II.B of the memorandum from the Division of Mechanical and Combustion Engineering, "Proposed Requirements for Mitigating the Debris Penetration Hazards Associated with Recreational Off-Highway Vehicles (ROVs) and Utility Task/Terrain Vehicles (UTVs)," summarizes details from the 53 IDIs.

Fifty-one IDIs involved tree branches penetrating the floorboards, whereas two of the IDIs involved rocks breaking through the floorboards. All the IDIs involved ROVs, except one, which involved a UTV. Debris penetrations occurred two or more times for a single vehicle for some consumers, as described in seven of the IDIs.

Thirty-three IDIs had information regarding stick diameter. For those IDIs that had information regarding stick diameter, death or injury occurred from a stick with a diameter between 1 to 3 inches. Forty-one IDIs had information regarding the estimated vehicle speed at time of impact. For those incidents involving debris penetration from wood, the estimated vehicle speed ranged from 2 mph to 25 mph. Thirty-nine IDIs had information regarding whether seatbelts were fastened or not during the accidents.

IDI interviewees in their responses sometimes gave ranges to estimate stick diameters and vehicle speeds. For example, an interviewee believed a stick that penetrated the floorboard was approximately 1 to 1.5 inches. The average stick diameter for the low range was 2.1 inches and 2.5 inches for the high range. For estimated vehicle speeds, the average speed for the low range was 10.2 mph and 12.1 mph for the high range. Most of interviewees, 66 percent (27 out of 41 IDIs), reported debris penetrations occurring at 10 mph or less.

In two IDIs where the estimated speed was 5 mph, two consumers experienced injury to their shin and foot. Only one incident included estimated vehicle speeds greater than 25 mph.

Given that ROVs/UTVs are used in forested trails, it is reasonable to expect that the floorboards should protect consumers when ROVs/UTVs are operating at speeds of 10 mph or less in these environments.

Staff measured the floorboards of several model ROVs and determined that the average thickness of the plastic floorboards was between 0.1 and 0.2 inches. In addition, staff's analysis of incident photos indicates brittle failure (*i.e.,* where the material does not stretch) of the plastic floorboard when penetration occurred, because the floorboard was not able to absorb the high kinetic energy of the floorboard-stick collision. Edges of the holes or cracks are usually clean (*i.e.*, no material stretch indications).

B. Debris Penetration Testing

The Commission contracted with SEA Ltd. (SEA), to conduct debris penetration testing with a remotely operated robotic ROV and a ROV mock-up sled that can move on a linear track. The purpose of SEA's testing was to quantify the speed and energy necessary for debris, *e.g.*, a stick or a branch, to penetrate a ROV floorboard. SEA conducted debris penetration testing with a remotely operated robotic ROV and also conducted controlled laboratory tests with mock-up ROVs on SEA's sled facility. Although SEA's study was conducted on ROV models, because the floorboard and UTV front architectures are similar, and in some cases, the same as ROV models, the concepts, observations, and discussions related to ROVs are equally applicable to UTV models.

As part of SEA's analysis, SEA reviewed debris penetration IDIs provided by CPSC staff. SEA determined that a common pattern in most of the severe injury accidents was that a branch or stick, generally, 1 to 2 inches in diameter, penetrated through the vehicle floor, particularly in the foot rest/wheel well areas. Typically, the stick was longitudinal to the vehicle, and positioned at an upward angle. The end of the stick closest to the vehicle was high enough to get above or between the front suspension components of the vehicle. The end of the stick farther from the vehicle was either attached to a larger piece of wood or embedded in the ground. SEA observed that sticks penetrating the vehicle's occupant space were generally straight, and could have diameters as high as 5 inches, or as small as 1 ¼ inches. Occupants experienced chest/abdomen impalements or impalements/lacerations to lower extremities.

SEA's initial testing consisted of a remotely operated robotic ROV that was driven into a stationary dowel[4] at 10 mph, as shown in Figure 3. SEA conducted two tests with a remotely operated robotic ROV to examine the specifics of a debris penetration event. SEA determined that a dowel could contact the metal frame members that can influence the trajectory of the dowel and the way the dowel penetrates the floorboard. Contact in this manner would allow the dowel to experience both compressive and bending forces. The bending forces caused the dowel to snap after impact when the robotic ROV was traveling at 10 mph, as shown in Figure 2.

Figure 2 – Multiple Views of the Robotic ROV involving Collision at 10 mph; Left – Alignment of the Test Dowel with Test Target on the ROV Floorboard; Middle – Front View of Broken Dowel; Right – Side View of Test Dowel that Entered the ROV Passenger Occupant Area

The second series of testing consisted of a ROV mock-up sled, fitted with OEM floorboards and aftermarket floorboard guards, as shown in Figure 3.

[4] SEA used a 2-inch diameter oak dowel between 39 inches to 65 inches long for the sled testing. Oak is a hardwood with a relatively high modulus of rupture and modulus of elasticity material properties. A 2-inch diameter oak dowel is a mass-produced item that is readily available. Use of a consistent test component will minimize test-to-test variability.

Figure 3 – Multiple Views of the Simulated Vehicle Test Sled; Left – Test Dowel in Relation to the Direction of the Test Sled; Middle – Side View of an Example of a Fully Loaded Test Sled; Right – Side View of a Sled Test Where the Test Dowel Penetrated the ROV Floorboard

Both test methods allowed the robotic ROV or the ROV sled to collide with a stationary dowel. The full-scale robotic ROV test showed similar penetration location and puncture characteristics for the sled test (see Figure 4). Both test methods resulted in a dowel penetration through the seam area between the floorboard and firewall[5] sections. By performing these engineering tests, SEA quantified the speeds and energies required to puncture the floorboards and floorboard guards.

Figure 4 – Comparison of Full-Scale Robotic ROV Test and Sled Test; Left – Robotic ROV Test Where Dowel Penetrated the Seam that Joins the Floorboard and Firewall Panels; Right – Sled Test Where the Dowel Penetrated the Seam that Joins the Floorboard and Firewall Panels

[5] On many ROVs/UTVs, there are two plastic floor panels. The main floorboard panel covers the floor and footwell areas in front of the feet. A second, semi-vertical plastic panel that is joined to the main floorboard is often known as the firewall, which is located higher up, at the knee level and above.

Floorboards and aftermarket floorboard guards from five ROV manufacturers were tested using the sled method. SEA conducted a total of 21 test trials. SEA used sled speeds of 2.5, 5, and 10 mph.

The sled tests showed that the stock floorboards for two ROV manufacturers experienced debris penetrations at 2.5 mph. The stock floorboards for all five ROV brands experienced debris penetration at 5 mph. Figure 5 illustrates a stock floorboard that experience debris penetration at 2.5 mph.

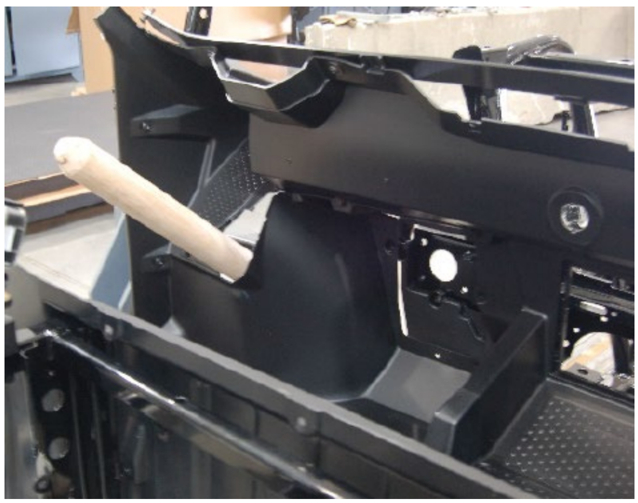


Figure 5 – Interior View, Driver's Side Floorboard Where
Debris Penetration Occurred at 2.5 mph

SEA tested various branded aftermarket metal and plastic floorboard guards to gauge their material strength properties to resist debris penetration. Among the 21 test trials, a metal guard for one brand of ROV did not have debris penetration at 10 mph. Two test trials at 5 mph with metal guards and one test trial with a plastic guard at 5 mph did not have debris penetration. All other test trials with plastic or metal guards failed at 10 or 5 mph.

For tests that did not experience debris penetration, the test dowel was redirected, or the dowel slid off to the side or upwards. In such cases, the bending forces caused the dowel to snap off. In some instances, the sled yawed and pitched before the sled came to a complete stop.

These actions accomplished the guards' goal of protecting the occupants from the debris penetration hazard. Figure 6 illustrates an aluminum floorboard guard with a black powder coated paint surface that prevented debris penetration at 5 mph. The test sled pitched and yawed, while the tip of the dowel slightly dented, then scraped the floorboard guard's surface and slid to the right before the test sled came to complete stop.

Figure 6 – Illustration of an Aluminum Floorboard Guard that
Redirected the Test Dowel and Prevented Debris Penetration (at 5 mph)

SEA staff procured the aftermarket guards from multiple online vendors. The existence of a market for these guard products suggests there is a need for enhanced protection against debris penetration. CPSC is aware of products in the marketplace that can resist debris penetration, and these retrofit products offer additional protection when compared to stock floorboards that can experience debris penetration at speeds as low as 2.5 mph.

From its testing, SEA concluded:

- If better guards are to be designed, it is likely that they will not work by absorbing energy, but rather, by redirecting the dowel, or breaking it off.

- Guards that worked well in the sled testing tended to work well because they pushed the dowel up and/or to the side. Ideally, the guards would push the stick all the way to the side of the vehicle and outside the zone of the occupant compartment.
- Testing showed that a successful design for an aftermarket guard or OEM floorboard could involve deflecting the dowel, rather than taking on the force directly. Several of the aftermarket guards were successful at doing this at 5 mph, and one of the guards tested was successful at 10 mph.

The test dowel did not break in testing that involved a metal floorboard guard that was sturdy enough to prevent debris penetration at 5 mph. The test dowel deformed the floorboard guard in a scraping manner without puncturing the floorboard guard, and the test sled pitched and yawed before coming to a full rest. However, the test dowel did break at 10 mph for this same metal floorboard guard, due to the bending forces being greater when the test sled speed was doubled. If a floorboard or floorboard guard is sturdy enough, there will be a greater tendency for the floorboard or floorboard guard to deflect the dowel and increase the dowel's bending forces when the test sled speed is at 10 mph or higher. Thus, a floorboard or floorboard guard that can prevent debris penetration at 10 mph will likely prevent debris penetration at speeds above 10 mph.

The requirements and test procedure of the proposed rule are in Section VI of this preamble.

VI. Proposed Requirement, Test Procedure, and Prohibited Stockpiling

A. Proposed Requirement

ROVs and UTVs equipped with current ROV/UTV floorboards offer minimal to no protection to the occupants in debris penetration events. Stick/branch penetration of floorboards poses impalement and/or laceration hazards and the risk of serious injury or death. SEA's sled testing showed that dowel penetration can occur at speeds as low as 2.5 mph on ROVs equipped with standard OEM floorboards. Multiple full-scale tests re-created stick/branch penetration in the occupant area, a hazard reported in at least 107 incidents, 6 resulting in fatalities.

To reduce deaths and injuries associated with the debris penetration hazards, the Commission is proposing a performance requirement and a test procedure that propels a test vehicle or simulated vehicle sled at a minimum speed of 10 mph towards a stationary 2-inch diameter oak dowel, positioned at an angle between 12° and 25°, to strike the front wheel suspension area of the vehicle. The performance requirement specifies that the dowel cannot penetrate the occupant area when tested to the proposed impact test procedure.

For the majority of the IDIs that had vehicle speed information, 66 percent (27 out of 41 IDIs), of the debris penetration events occurred at 10 mph or less. A test vehicle or simulated vehicle sled colliding with a stationary 2-inch diameter oak dowel at 10 mph represents a realistic debris penetration scenario. The requirement will reduce the likelihood of impalement and/or lacerations from debris penetration, by preventing penetration into the occupant area of these vehicles. The SEA testing showed that an aftermarket floorboard guard can prevent debris penetration at 10 mph. Instead of energy absorption, the aftermarket guard redirected the dowel, allowing the bending forces to snap the dowel. It is likely that floorboards or the wheel-well area of ROVs/UTVs can be designed to resist debris penetration by redirecting the dowel to the side or upwards to avoid injuring the occupants. This type of mitigation design would also be effective at higher vehicle speeds.

B. Test Procedure

1. Load Condition

The test protocol requires a load condition of 430 lbs for a two-seat ROV or UTV model. The 430 lbs represents a driver and a front seat passenger, each equivalent to a 95th percentile male (215 pounds). For a four-seat model, the load condition requirement is 860 pounds, representing the driver and three passengers. For a six-seat model, the load condition is 1290 lbs, representing the driver and five passengers. Models containing these minimum load weights are described below as "fully loaded."

2. Test Vehicle or Simulated Vehicle Sled Conditions

The fully loaded test vehicle is to be fitted with the test floorboard and/or floorboard guard(s), as offered for sale. If a simulated vehicle sled is used, such that a ROV/UTV front metal frame is fitted with the test floorboard and/or floorboard guard(s), the simulated vehicle sled must be able to translate on a linear track that can propel the simulated vehicle sled to at least 10 mph.

3. Test Speed

The test vehicle or simulated vehicle sled speed, in miles per hour (mph), must be at least 10 mph at the moment of impact.

4. Test Location

The test dowel is to be positioned at an angle between 12° and 25° such that it will strike the upper wheel well area of the vehicle. The target of the test dowel must be either the floorboard or floorboard guard surface of the vehicle, and it must be the point on the floorboard or floorboard guard most likely to produce the most adverse results, such as a seam, crease, catch point, or bend.

5. Test Equipment

The test procedures prescribe the diameter (2-inches) and length of the dowel (between 39 to 65 inches) and the angle in which the dowel is to be installed in the dowel holder (between 12° to 25°). A range of angles and a range of dowel lengths are necessary, due to the various shapes, depths, contours, suspension component arrangements, and control arm dimensions of all the ROV/UTV wheel-well configurations. See Figure 7.

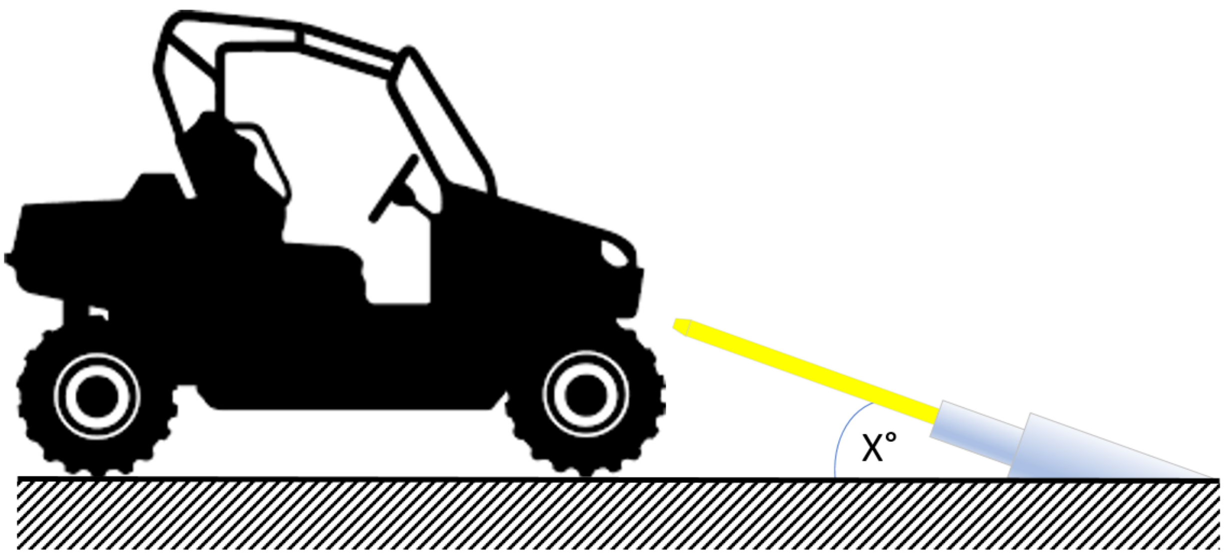


Figure 7-– Illustration of Debris Penetrator Test Dowel Orientation

The test procedure also requires that the tip of the dowel be tapered, such that the tip surface diameter is 1 inch, and the tip cone length is 1 inch. See Figure 8.

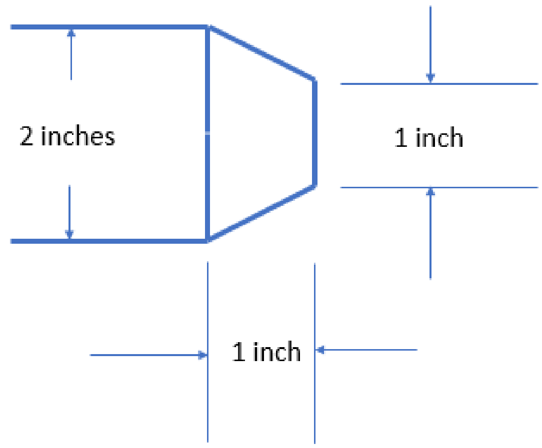


Figure 8 – Illustration of Debris Penetrator Test Dowel Tip Taper

The dowel holder must be constructed of a rigid material, such that the dowel holder will not fracture during the course of the impact test.

A vehicle or simulated vehicle sled braking system and/or energy absorption foam blocks located two feet past the debris penetration dowel holder are recommended to minimize damage to test equipment. If a braking system is used, it is only permitted to activate after the vehicle or simulated vehicle sled collides completely with the debris penetrator dowel.

6. Test Conditions

If a test vehicle is used, the test surface must be dry asphalt or dry concrete that is free of contaminants. There must be sufficient track length available to allow the test vehicle or simulated vehicle sled to reach 10 mph. The test surface must be flat and have a grade slope of 1.7 percent (1°) or less. The ambient temperature shall be greater than 0°C (32°F).

7. Test Procedure

In the test procedure, a fully loaded, fully instrumented test vehicle or simulated vehicle sled is propelled in a straight-line path to collide with the test dowel, where the test vehicle or simulated vehicle sled speed is at least 10 mph at the moment of impact. A minimum of two test trials of one chosen test method must be conducted for each vehicle model.

8. Rationale – Test Conditions

The required ambient temperature of 0°C (32°F) or greater, maximum allowable flat course slope grade of 1.7% (1°) or less, the maximum allowable wind speed of 11.2 mph (18 km/h), flat dry asphalt or dry concrete conditions, and the 95th percentile male weight are consistent with the lateral stability requirements of ANSI/OPEI B71.9-2016 and ANSI/ROHVA-1-2016, simulate real use, and allow for repeatable test results.

C. Prohibited Stockpiling

The proposed rule includes an anti-stockpiling provision that would prohibit manufacturers and importers from stockpiling products that will be subject to the mandatory rule. The Commission's authority to issue an anti-stockpiling provision is in section 9(g)(2) of the CPSA. 15 U.S.C. 2058(g)(2). The anti-stockpiling provision would prohibit ROV and UTV manufacturers and importers from manufacturing or importing ROVs or UTVs that do not comply with the requirements of the proposed rule between the date of the final rule publishing in the **Federal Register** and the effective date of the rule, at a rate greater than 120 percent of the rate at which they manufactured or imported ROVs or UTVs during the *base period* for the manufacturer.

The *base period* is described in the proposed rule as any period of 365 consecutive days, chosen by the manufacturer or importer, in the 5-year period immediately preceding promulgation of the final rule. "Promulgation" means the date the rule is published in the **Federal Register.**

VII. Response to Comments

The Commission published the Off-Highway Vehicle (OHV) Fire and Debris Penetration Hazards Advance Notice of Proposed Rulemaking (ANPR) in the *Federal Register* on May 11, 2021. The public comment period ended on July 12, 2021. CPSC received 10 comments from the public, which can be found under docket number CPSC-2021-0014, at: www.regulations.gov. Four of the comments support the rulemaking; six of the comments do not support the rulemaking. We respond to the comments pertaining to debris penetration hazards here.

Comment: Four comments express support for the rulemaking. Three of these comments (American Academy of Pediatrics, Kids in Danger, and Public Citizen) state that voluntary standards for ROVs and UTVs fail to adequately protect consumers, given the injuries, deaths and incidents that have occurred related to debris penetration. In addition, these three comments note that the voluntary standards do not include any requirements to protect against debris penetration. Kids in Danger further asserts that research shows a correlation between mandatory standards on products and a reduction of regulated product-specific deaths.

Response: Staff concurs with these comments, because the current voluntary standards, ANSI/ROHVA-1-2016 and ANSI/OPEI B71.9-2016, do not have resistance to debris penetration performance requirements that adequately protect consumers, given the injuries, deaths, and incidents that have occurred related to debris penetration.

Comment: The American Academy of Pediatrics suggests that the rulemaking should account for the unique hazards of OHVs used by children, especially for “youth model” products marketed toward younger drivers.

Response: At least one ROV manufacturer offers youth-oriented ROVs that are smaller versions of the full-size ROVs. These ROVs, however, have materially different risks of penetration than the risk for full-size ROVs, due to their lower ground clearance and distinct wheel-well configuration. Further, there are no incident data involving these vehicles. The Commission, accordingly, has not included these products in the scope of the proposed rule.

Comment: ROHVA and two individuals, Mark Strauch, and Steve Tavara, state that it is not clear whether the debris penetration hazard incidents identified in the ANPR were caused by lack of clear sight, user error, or whether the driver and/or passenger were impaired in some fashion. Mark Strauch also states it is unclear whether ROVs are becoming dangerous due to "improper installation, inspection, operation, and/or maintenance."

Response: Staff examined incident data that showed that debris penetrations occur at speeds as low as 2 mph. For 44 percent of the IDIs that had information regarding vehicle speed at the time of debris penetration, the vehicle speeds during collisions with tree branches were 5 mph or less. These data suggest that consumers were generally not reckless, and the ROV/UTV floorboard debris penetrations are occurring under non-severe conditions. Consequently, staff concluded that there was an issue with the vehicle itself rather than the operator's behavior or maintenance of the vehicle. By their nature, ROVs and UTVs are intended to be driven on off-highway environments. It is foreseeable that in an off-highway environment, a vehicle might encounter sticks or branches. Penetration of a stick/branch into the vehicle's cabin area, even at such low speeds, is indicative of insufficient debris resistance of the vehicle. Staff assesses that a vehicle intended to be driven in off-highway environments should not be susceptible to debris penetration at such low-speeds, regardless of maintenance or inspection of the vehicle.

Comment: Commenters ROHVA, OPEI, SVIA, and Polaris, Inc. ("Polaris"), advocate addressing debris penetration hazards through the voluntary standards process instead of through rulemaking.

Response: Although CPSC staff has engaged with the standards development organizations ("SDOs") on this topic for years, no substantial progress has been made regarding debris penetration hazards. Since 2018, the three SDOs and CPSC staff met multiple times to discuss debris penetration hazards, but no substantial progress has been made, and discussions remain in the preliminary idea phase. CPSC staff will continue to engage with these SDOs, to review any proposals they may present, and consider those proposals as CPSC continues with its rulemaking activities.

Comment: ROHVA, Polaris, and Mark Strauch assert that the Commission should withdraw its ANPR because it lacks sufficient information to determine that there is an "unreasonable risk of injury" associated with debris penetration hazards. ROHVA asserts that debris penetration incidents are rare and involve "highly dissimilar factors," making them unsuitable for consideration for mandatory rulemaking.

Response: Staff disagrees that debris penetration incidents are rare. CPSC staff has determined that 6 deaths and 22 injuries resulted from ROV debris penetration. There were 107 debris penetration incidents involving ROVs or UTVs in CPSC databases. Manufacturers reported 632 debris penetration incidents related to three different recalls.[6]

Staff also disagrees with the notion that debris penetration incidents involve "highly dissimilar factors," such that a mandatory rule would be ineffective. The incidents show that a consistent factor in debris penetration incidents is the penetration of debris into the floorboard of the vehicles when they are being driven, as marketed and intended, in off-road environments, even at low-speeds. The proposed test requirement would address the inadequacy of the floorboards to protect occupants in the vehicle. CPSC contractor SEA procured aftermarket

[6] The manufacturer-reported data is separate and distinct from the data from CPSC databases; there may be some overlap between the two.

floorboard guards from seven different vendors for their test program. The fact that there is already a robust market for aftermarket floorguards suggests that, contrary to being rare, debris penetrations are occurring often enough that there is substantial consumer interest in products to potentially remedy the risk of debris penetrations.

Comment: ROHVA comments that it is inaccurate to characterize the 630 manufacturer reports associated with the three debris penetration recalls as “debris penetration incidents,” because not all of the incidents involved debris penetration *through* the floorboard. ROHVA notes that the press release for the largest of the three recalls states that there were “628 incident reports of debris cracking or breaking through the floor boards.”

Response: The manufacturer reports consisted of floorboards either cracking or breaking during normal operation due to impact with, or penetration by, debris from outside the vehicle. Whether or not the debris penetrated through the floorboard, staff considers the cracking or breaking of the floorboards by objects during normal operation of the vehicle to be indicative of a penetration hazard.

VIII. Preliminary Regulatory Analysis

A. Introduction

Pursuant to section 9(c) of the Consumer Product Safety Act, publication of a proposed rule must include a preliminary regulatory analysis containing:

- A preliminary description of the potential benefits and potential costs of the proposed rule, including any benefits or costs that cannot be quantified in monetary terms, and an identification of those likely to receive the benefits and bear the costs.
- A discussion of the reasons why a standard submitted to the Commission in response to the ANPR was not published as the proposed rule.

- A discussion of why a relevant voluntary safety standard would not eliminate or adequately reduce the risk of injury addressed by the proposed rule.
- A description of any reasonable alternatives to the proposed rule, together with a summary description of their potential costs and benefits and why such alternatives should not be published as a proposed rule.

The primary focus of this preliminary regulatory analysis is the Commission's preliminary assessment of potential benefits and costs from the proposed rule. CPSC staff estimates benefits by subtracting the expected societal costs (*i.e.*, deaths and injuries from floorboard debris penetration), assuming the rule has been implemented, from the expected societal costs in the absence of the rule (or baseline scenario). Estimated costs include costs to industry from implementing a ROV/UTV fix that addresses the debris penetration hazard, the costs associated with government oversight and compliance monitoring, and the deadweight losses that are the measured impacts to consumers and producers displaced from the ROV/UTV market because of a potential price increase. CPSC staff estimated benefits and costs over a 30-year period starting in 2024, which is the year that the rule would go into effect. A 30-year period allows for several cycles of useful life for ROVs and UTVs and ensures the assessment accounts for the long-term effects of the proposed rule. Staff presents all estimates in 2021 dollars. To account for the time value of money, staff applied an annual 3 percent discount rate to forecasted benefits and costs.

The preliminary regulatory analysis also explains why voluntary safety standards would not eliminate or adequately reduce the risk of injury addressed by the proposed rule. It describes alternatives to the proposed rule and their potential costs and benefits, and it explains why these alternatives should not be published as a proposed rule. In addition, although the ANPR invited commenters to submit standards for publication as the proposed rule, or part of the proposed rule, no standard was submitted during the ANPR comment period, and thus, no standard was available for the Commission to consider.

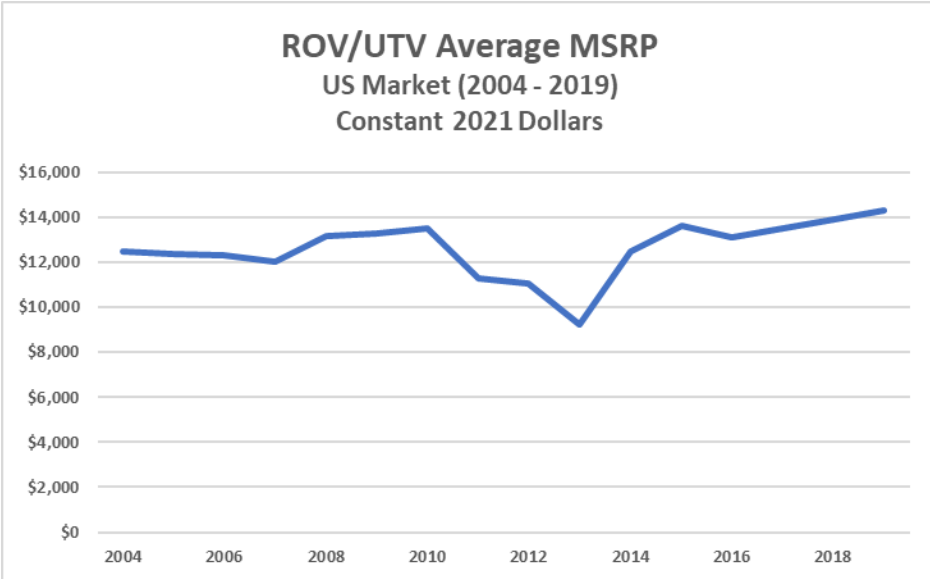
B. Market Information

1. Retail Prices

In 2019, ROV and UTV manufacturers' suggested retail prices (MSRP) ranged from a minimum of $4,599 to a maximum of $53,700. When weighted by sales volume, the mean MSRP is $13,182 for ROVs and UTVs,[7] which, in 2021 dollars, equates to $14,302. As shown in Figure 8, before 2013, the average ROV and UTV MSRP showed a downward trend. However, beginning in 2013, the average ROV and UTV MSRPs have increased steadily. This trend appears to be driven by increasing sales of more expensive models with higher maximum MSRPs. Figure 9 displays MSRPs for ROVs and UTVs from 2004 through 2019, in constant 2021 dollars.

[7] Unless otherwise noted, the ROV/UTV product and market information is based on CPSC staff analysis of 1998–2019 sales data provided by Power Products Marketing, Eden Prairie, MN (2020).

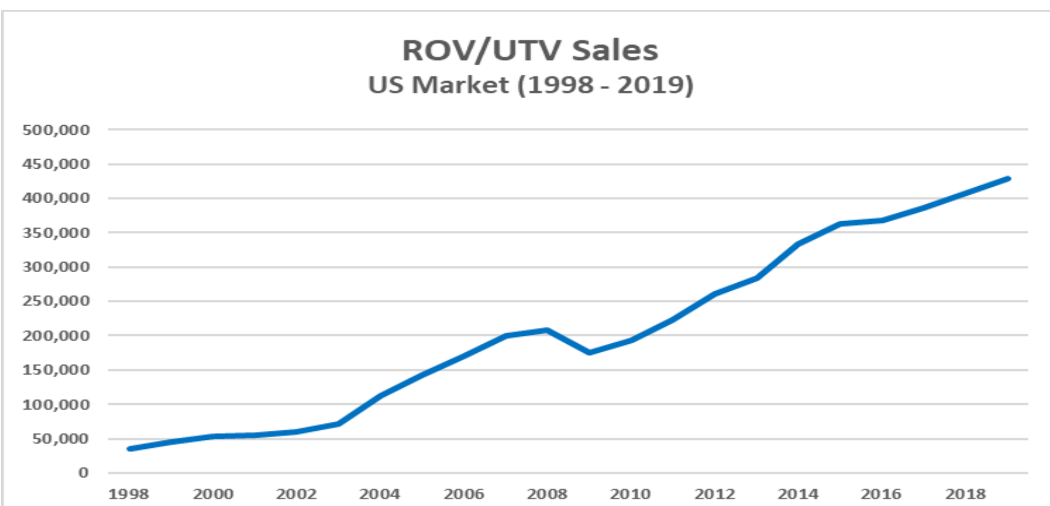
Figure 9: ROV & UTV Average MSRP



1. Annual Sales and Shipments

Except for 2009, annual sales of ROVs and UTVs in the United States have increased steadily, from an estimated 35,041 units in 1998, to an estimated 429,135 units in 2019. Figure 10 illustrates combined ROV and UTV unit sales from 1998 through 2018.

Figure 10: Unit Sales of ROV/UTVs from 1998 to 2018



Staff identified 35 manufacturers known to have supplied ROVs and UTVs to the U.S. market in 2019: 17 from the United States, 14 from China (including Taiwan), and one each from Canada, Mexico, South Korea, and Spain. Additionally, there are 48 distributers/brands. Staff estimated U.S. manufacturers accounted for approximately 83 percent of U.S. ROV and UTV sales in 2019, and that current members of ROHVA and/or OPEI accounted for approximately 95 percent of U.S. ROV and UTV sales in 2019.

Staff identified 461 different ROV and UTV model variants and configurations sold in the United States in 2019. Excluding variants and configurations that appear to be based on a common base model, staff estimated that there may be as few as 107 unique models introduced in 2019, and they estimated a total of 672 models in use by consumers.

2. Estimated ROV and UTV Units in Use

Staff estimates there were 2.34 million ROVs and UTVs in use in the United States in 2019. The Commission developed this estimate based on the number of sales of ROV and UTV in prior years, and then designated a product life (in years) to each unit sold. The distribution of product life years for ROVs and UTVs informs the analysis of what proportion of units will last above or below its average product life. For example, the average product life for an ROV/UTV is 6 years. Therefore, a plurality of ROVs/UTVs will be in use for 6 years, but some ROVs/UTVs will be in use less than the expected 6 years, while others will be in use longer than 6 years. The distribution of product life informs this analysis of what proportion of sold units will fall into each amount (in years) of product life. This process helps assess how many ROVs/UTVs are still in use, given any number of years after they are sold.

C. Preliminary Regulatory Analysis: Benefits Assessment

This section presents the potential benefits associated with implementing the performance requirement from the proposed rule for mitigating debris penetration hazards associated with ROVs and UTVs.

1. Benefits Assessment Methodology

The Commission conducted the preliminary regulatory analysis from a societal perspective that considers significant costs and health outcomes. The Commission captured expected reduction in societal costs by estimating the number of deaths and injuries from debris penetration that would be prevented by the proposed rule. The Directorate for Epidemiology (EP) retrieved casualties reported through NEISS, a national probability sample of U.S. hospital emergency departments (ED), and the CPSRMS database of consumer incident reports. Staff then forecasted the number of expected reported deaths and injuries for a 30-year study period and converted the value of prevented deaths and injuries into monetary terms using the Value of Statistical Life (VSL) for deaths and CPSC's Injury Cost Model (ICM) for injuries.

Staff used a 30-year study period to assess the benefits of the proposed rule. Staff assumed, for the purpose of this analysis, that the rule will go into effect at the beginning of 2024; this results in a study period of 2024 through 2053. A 30-year period allows for several cycles of useful life for ROVs and UTVs and ensures the benefits assessment accounts for all long-term effects from the proposed rule. Staff then converted the aggregate benefits over the 30-year study period into annualized and "per-product" outputs. An annualized output converts the aggregate benefits over 30 years into a consistent annual amount while considering the time value of money. This metric is helpful when comparing the benefits among different rules or policy alternatives that may have different timelines; or those that have similar timelines, but benefits for one are front-loaded, while the other's benefits have a latent effect. A per-product metric expresses the benefits from the rule in one unit of product. This metric is helpful when assessing the impact in marginal terms; for example, comparing benefits to an increase in retail price or marginal increase in cost of production per-unit.

2. Deaths and Injuries Over the 30-Year Study Period

CPSC staff identified six deaths and 22 nonfatal injuries that occurred from 2009 through 2021, related to debris penetration incidents involving occupants. Of the 22 nonfatal injuries, four required hospital admission, three resulted in ED treatment, two were treated and released, or released without treatment, one received first aid by a non-medical professional, and two received no treatment. The level of care provided for the remaining 10 incidents is not known. CPSC staff gathered these casualties from NEISS (three nonfatal incidents) and CPSRMS (the remaining incidents) and confirmed there was no overlap.

Next, staff used the incident data on debris penetration from NEISS and CPSRMS to forecast the number of injuries from debris penetration treated in EDs and other settings throughout the 30-year study period. Typically, the Commission would use reported injuries from NEISS, which only records injuries from a sample of U.S. hospitals, and then the Commission would extrapolate the data into a national estimate. However, the number of recorded incidents of debris penetration from the sample hospitals was lower than the publication criteria established in NEISS. Therefore, staff could not develop a national estimate and had to estimate the benefits using a forecast of reported injuries from the sample hospitals only. There are likely many more unreported incidents outside of the sample hospitals not accounted for in this analysis, and thus, staff's estimated benefits are likely an underestimate.

To forecast future deaths and injuries from debris penetration, staff used death and injury rates per million ROVs/UTVs with its forecast of "ROVs/UTVs in use" throughout the 30-year study period. Staff assumed deaths and injuries would stay the same as the average rates observed between 2010 to 2019[8] in the NEISS and CPSRMS databases: 0.36 deaths, 0.24 hospital admissions, 0.24 ED admissions, and 0.72 doctor/clinic visits per million ROVs/UTVs in use.

Staff forecasted ROVs/UTVs in use using exponential smoothing. Staff then multiplied the number of ROVs/UTVs in use in each year of the study period by the rates of deaths and injuries, to estimate the total number of deaths and injuries for each year of the 30-year study period. Figure 11 displays the estimated number of incidents for each death and injury category from 2010 through 2053 in the baseline scenario, which assumes the proposed rule does not go into effect.

Figure 11 Number of Injuries and Deaths from ROV/UTV Debris Penetration

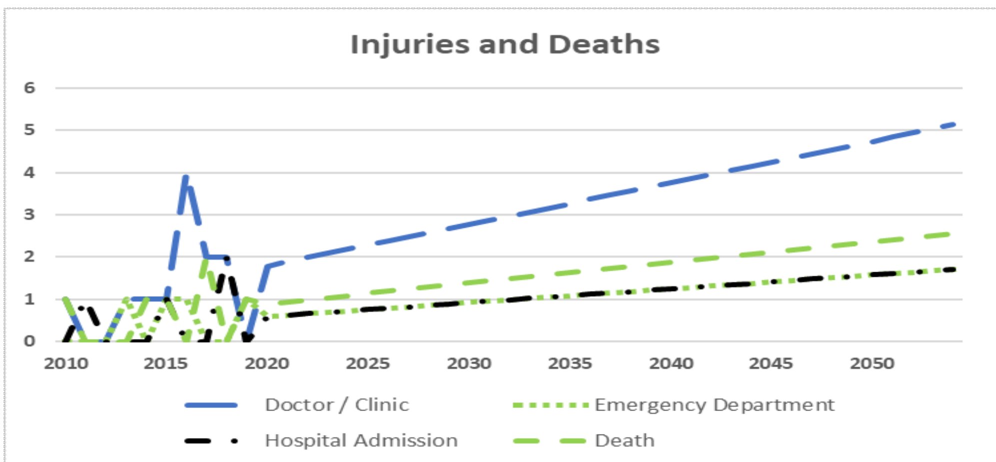


Figure 11 illustrates that most injuries are treated in a doctor's office/clinic. In the year 2053, estimated injuries treated at a doctor's office/clinic reach 5 per year; injuries treated at the

[8] The Commission based its estimated injury rates on the incident data from the window 2010-2019. This window represents a typical 10-year time frame for data analysis, and was the most robust, most recent data that was continuous. Because of ongoing reporting, data from the latest years, 2020 and 2021, are incomplete, and were thus not used in the analysis.

ED and those admitted to the hospital largely overlap over the analysis period and reach 1.7 in both cases in 2053; and the estimated number of deaths reaches 2.5 in 2053. In the same year, staff estimated the number of ROVs and UTVs in use to reach 6.98 million, or about three times the number in use in 2019.

3. Societal Costs of Deaths and Injuries Over the 30-Year Study Period

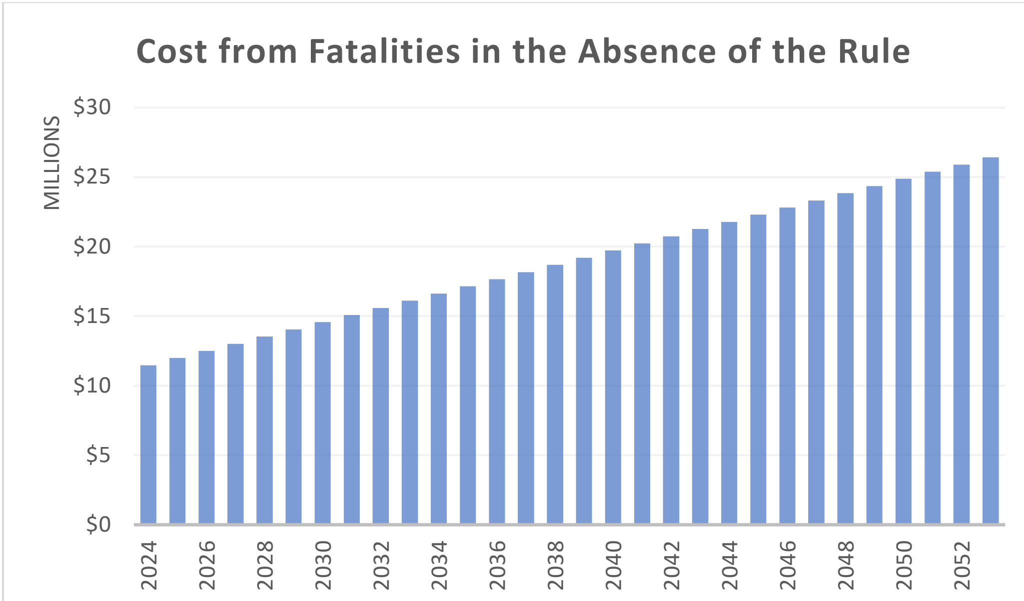
This section presents the methodology to monetize the costs from deaths and injuries from debris penetration in the absence of the rule and determines how much those societal costs would be avoided if CPSC promulgated the proposed rule.

a) Societal Cost from Deaths

To estimate the societal costs of debris penetration-related deaths, staff applied the VSL. VSL is an estimate used in benefit-cost analysis to place a value on reductions in the likelihood of premature deaths. The VSL does not place a value on individual lives, but rather, it represents an extrapolated estimate based on the rate at which individuals trade money for small changes in mortality risk. This is a "willingness to pay" methodology that attempts to measure how much individuals are willing to pay for a small reduction in their own mortality risks, or how much additional compensation they would require to accept slightly higher mortality risks. For this analysis, staff applied a VSL developed by the U.S. Environmental Protection Agency (EPA). The EPA VSL, when adjusted for inflation, is $10.5 million[9] in 2021 dollars. Staff multiplied the VSL by the number of forecasted deaths throughout the study period to calculate societal cost of deaths from debris penetration in the absence of the proposed rule. Figure 12 displays these costs throughout the study period.

[9] In 2008, the EPA estimated the value of a statistical life at $7.9 million. CPSC adjusted this estimate for inflation to the end of 2021, using the Consumer Price Index for All Urban Consumers (CPI-U), estimated the Bureau of Labor Statistics and rounded it to the nearest hundred thousand. The adjustment is as follows: $7.9M x (278.802/210.228) = $10.477M, which is then rounded to $10.5M.

Figure 12: Annual Cost from Fatalities



According to Figure 12, in the first year of the study period (2024), costs from deaths are $11.47 million and grow to $26.42 million in 2053. Over 30 years, estimated societal costs from deaths due to debris penetration aggregate to $568.3 million, according to CPSC staff estimates.

b) Societal Cost from Injuries

CPSC staff estimated the societal costs of nonfatal injuries from debris penetration using the ICM. The ICM provides estimates of the societal costs of medically treated injuries. The societal cost components provided by the ICM include medical costs, work losses, and the intangible costs associated with pain and suffering.

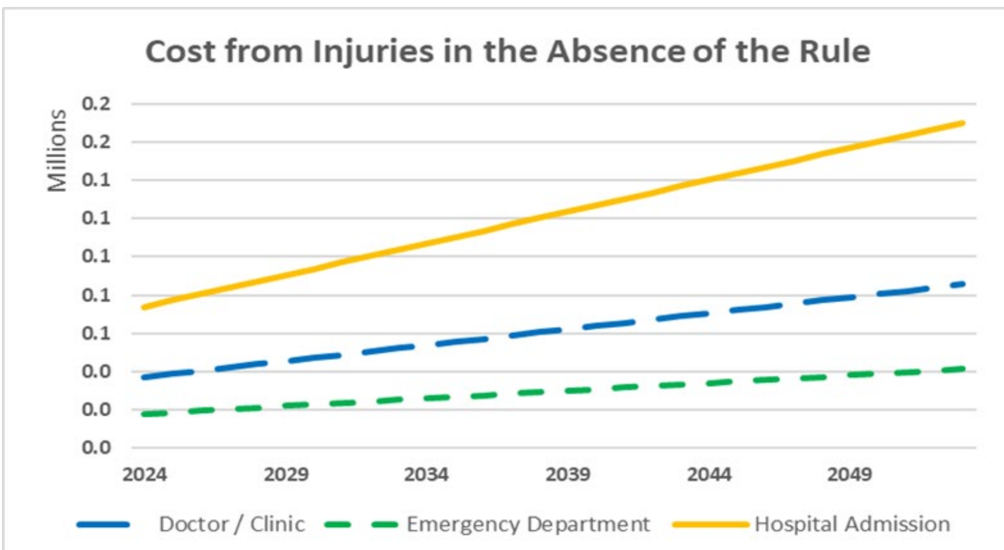
Medical costs include three categories of expenditures: (1) medical and hospital costs associated with treating the injured victim during the initial recovery period and in the long run, including the costs associated with corrective surgery, the treatment of chronic injuries, and rehabilitation services; (2) ancillary costs, such as costs for prescriptions, medical equipment, and ambulance transport; and (3) costs of health insurance claims processing. The ICM derives cost estimates for these expenditure categories from several national and state databases, including the Medical Expenditure Panel Survey (MEPS), the Nationwide Inpatient Sample of the Healthcare Cost and Utilization Project (HCUP-NIS), the Nationwide Emergency Department Sample (NEDS), the National Nursing Home Survey (NNHS), MarketScan® claims data, and a variety of other federal, state, and private databases.

Work loss estimates include: (1) the forgone earnings of the victim, including lost wage work and household work; (2) the forgone earnings of parents and visitors, including lost wage work and household work; (3) imputed long-term work losses of the victim that would be associated with permanent impairment; and (4) employer productivity losses, such as the costs incurred when employers spend time rearranging schedules or training replacement workers. The ICM bases these estimates on information from the MEPS, the Detailed Claim Information (a workers' compensation database) maintained by the National Council on Compensation Insurance, the National Health Interview Survey, the U.S. Bureau of Labor Statistics, and other sources.

The intangible costs of injury reflect the physical and emotional trauma of injury, as well as the mental anguish of victims and caregivers. Intangible costs are difficult to quantify because they do not represent products or resources traded in the marketplace. Nevertheless, they typically represent the largest component of injury cost and need to be accounted for in any benefit-cost analysis involving health outcomes. The ICM develops monetary estimates of these intangible costs from jury awards for pain and suffering. Although these awards can vary widely on a case-by-case basis, studies have shown that these awards are systematically related to several factors, including economic losses, the type and severity of injury, and the age of the victim. The ICM derives these estimates from a regression analysis of jury awards compiled by Jury Verdicts Research, Inc., in nonfatal product liability cases involving consumer products.

The ICM estimated that the costs (in 2021 dollars) associated with nonfatal debris penetration injuries are: $17,013 for injuries treated at the doctor's office/clinic, $24,694 for injuries treated at the emergency department, and $101,433 for injuries that result in hospital admission. The Commission multiplied these estimates by the number of forecasted incidents in Figure 11 to estimate societal costs from injuries through 2053. Figure 13 shows the forecasted societal costs from injuries in the absence of the rule through 2053.

Figure 13: Cost of Injuries



As reflected in the chart, society would incur a cost in the first year of the study period (2024) of $0.04 million for injuries treated at a doctor's office/clinics, $0.02 million for those treated at EDs, and $0.07 million for injuries resulting in hospital admissions. These costs grow to $0.09 million for doctor's office/clinic, $0.04 million for ED, and $0.17 million for hospital admissions in 2053. Over 30 years, staff estimated the societal costs from injuries due to debris penetration aggregate to $1.85 million for doctor's office/clinic, $0.89 million for ED, and $3.66

million for hospital admissions. The total cost for all injuries reaches $6.39 million over the 30-year study period.

c) Benefits from the Proposed Rule

The total estimated societal cost of deaths and injuries in the absence of the proposed rule would be $574.69 million over the study period (2024-2053). However, the proposed requirements in the proposed rule are not expected to mitigate all the deaths and injuries from debris penetration. Based on laboratory tests, CPSC staff estimates that approximately 95 percent of all incidents would be avoided because of the implementation of the proposed rule.[10] The Commission assesses that implementing the performance requirement would prevent all debris penetration incidents that occur when the vehicle is travelling 10 mph or below, and most incidents travelling above 10 mph.

Additionally, in the initial years after the implementation of the proposed rule, some noncompliant ROVs and UTVs will still be in use. To account for this, staff estimated the percentage of noncompliant ROVs/UTVs in each year during the 30-year study period. For instance, in the first year of the study period (2024), staff estimated that only 17.6 percent of ROVs/UTVs in use would be compliant, and only 16.7 percent (17.6 percent product compliant rate × 95 percent rule effective rate) of the $11.6 million in societal costs would be avoided because of the proposed rule, which equates to $1.94 million ($11.6 million × 16.7 percent). Staff estimates the compliance rate of ROVs/UTVs in use increases to 84.4 percent by 2029 (*i.e.,* 6 years from the implementation of the rule), and it approaches 100 percent by 2035. After this

[10] Staff supplements its assessment of a 95 percent effective efficacy rate with a sensitivity analysis that reduces the effective efficacy rate to 60 percent in section VIII.E.1 of this preamble, Uncertainty and Sensitivity Analysis. Sixty percent represents an approximation of the share of debris penetration incidents that occurred when vehicles were traveling 10 mph or below.

adjustment, staff estimated that from 2024 through 2053, an aggregate $537.29 million in societal costs would be avoided if the CPSC promulgated the proposed rule.

4. Annualized and Per-Vehicle, In-Use Benefits of the Proposed Rule

Staff converted the aggregate benefits over the 30-year period of study into annualized and "per-product" metrics.

The undiscounted average annual benefits are $17.02 million. To calculate present value, staff discounted the annual benefits in each year of the 30-year period using a compounding three 3 percent discount rate. The annualized benefits, at a 3 percent discount rate, are $15.47 million. To estimate the benefit per product, staff divided the annualized benefits (undiscounted and discounted) by the average number of compliant vehicles. Using this methodology, staff estimated the benefits from the proposed rule per ROV or UTV in use to be $20.32 per vehicle undiscounted and $12.07 per vehicle discounted at three 3 percent.

Table 4 presents the findings from this benefits assessment from both the annualized and per-product perspectives.

Table 4: Total and Per-Product Benefits, Undiscounted and Discounted at 3%

Benefits	Undiscounted	Present Value (Discounted at 3%)
Annualized ($M)	$17.02	$15.47
Per Vehicle ($)	$20.32	$12.07

D. Preliminary Regulatory Analysis: Cost Analysis

This section discusses the costs this proposed rule would impose on society. There are three sets of societal costs discussed under this cost section: the cost of implementing an ROV/UTV fix that addresses the debris penetration hazard; the costs associated with government oversight and compliance monitoring (considered negligible); and the deadweight losses or market impacts derived from the implementation of an ROV/UTV fix.

Like the benefits estimation, the time span of the cost analysis covers a 30-year period that starts in 2024, which is the expected year of implementation of the rule. This cost analysis presents all cost estimates in 2021 dollars, including cost estimates before 2021, using price index adjustments. This cost analysis also discounts costs in the future, using a 3 percent discount rate to estimate their present value.[11]

In this regulatory assessment, staff considers two solutions to the debris penetration hazards under the proposed rule, each with a separate set of costs. Both scenarios are effective in preventing debris penetration at 10 mph and below, and mitigating debris penetration above 10 mph. Both scenarios require manufacturers to redesign existing models to allow proper installation of the floorboard solution of choice.

1. Redesigned Floorboards: Manufacturers fully redesign floorboards where most of the material in the original floorboard is redistributed into a new shape and thickness that is required to address the debris penetration hazard. Manufacturers then redesign ROV/UTV models to enable the installation of the redesigned floorboards and meet the requirements of the new ROV/UTV proposed mandatory standards.
2. Floorboard Guards: Manufacturers redesign existing floorboards to add a 2’ x 2’ x 0.19” aluminum piece that acts as a floorboard guard and prevents debris penetration. This new aluminum piece’s design blocks debris from hitting hazardous sections of the floorboard. Manufacturers then redesign ROV/UTV models to enable the installation of floorboards

[11] Discounting future estimates to the present allows staff not only to consider the time value of money, but also the opportunity cost of the investment, that is, the value of the best alternative use of funds.

with floorboard guards that meet the requirements of the new ROV/UTV proposed mandatory standards.

This analysis assessed these two solutions as separate scenarios to produce a range of potential costs of compliance with the proposed rule. Some of the unit cost estimates in this analysis are based on SEA Ltd.'s testing and analysis. Under each scenario, staff assumed that 100 percent of manufacturers decide to adopt the solution being assessed. Therefore, staff estimated in each scenario the full cost of deploying that solution for all firms. In practice, however, manufacturers may choose a combination of the two solutions, or a different solution that proves more cost effective. Staff welcomes public comments on the likelihood of manufacturers adopting either solution or a solution not considered in this analysis.

- Cost of Implementing an ROV/UTV Fix to Debris Penetration

Manufacturers directly incur costs to redesign existing models and produce new designs that solve the debris penetration hazard, as well as the cost of producing and installing either a redesigned floorboard or floorboard guard on each new ROV/UTV manufactured after the implementation of this proposed rule is implemented. The increased cost is then passed indirectly on to wholesalers.

The subcategories of costs for implementing an ROV/UTV fix to debris penetration are:

- Cost of Redesigning Existing ROV/UTV Models and of New Designs

Manufacturers incur design costs that include redesigning existing ROV/UTV models, as well as designing future ROV/UTV models, which enable the installation of a floorboard solution to the debris penetration hazard.

Manufacturers would have to redesign existing ROV/UTV models with a floorboard solution if they wish to continue selling these models to consumers. Manufacturers, therefore, would have to allocate funds to produce a floorboard solution design and adapt existing ROV/UTV models to enable the installation of a floorboard solution. Manufacturers would likely incur expenditures in design labor, design production, design validation, and compliance testing. Each of these subcategories of costs are discussed below.

- Cost of Design Labor

The cost to compensate model designers employed by the manufacturer (or a third-party design shop) for the time it takes to produce a blueprint of the redesigned ROV/UTV model.

- Cost of Design Production

The cost of materials and labor required to fabricate prototypes of the ROV/UTV model.

- Cost of Design Validation

The cost of conducting validation testing of prototypes to ensure proper functioning of the redesigned ROV/UTV model and conformance with preset requirements established by the manufacturer. This is customarily conducted through in-house, indoor sled testing.

- Cost of Compliance Testing

The cost of conducting formal third party compliance testing to verify compliance with the requirements of the new ROV/UTV mandatory standards. Compliance testing is customarily conducted through third party testing.

Manufacturers would also be required to upgrade all new designs with the floorboard solution. A large-scale ROV/UTV manufacturer[12] conveyed to staff that once existing models have been redesigned with a working floorboard solution, new models can adapt such a solution at a minimal cost. Therefore, the additional cost of implementing a debris penetration solution onto future designs is considered negligible, and it is not addressed further in this analysis.

[12] CPSC staff conducted a virtual meeting on February 7, 2022, with a large manufacturer's representative to discuss the cost of implementing an ROV/UTV fix to the debris penetration hazard.

- Cost of Manufacturing and Installing a Floorboard Solution

Manufacturers directly incur costs to produce the floorboard solution of their choice[13] and install it in every new vehicle manufactured after the implementation of the proposed rule. Manufacturers would likely incur expenditures to purchase the required materials to fabricate the floorboard and produce and install the selected floorboard solution. These subcategories of costs are discussed below.

  - Cost of Materials and Production of the Floorboard Solution

Staff assumed that the production cost of the floorboard solution closely matches the production cost of the original floorboard. Therefore, the incremental production cost is negligible, and the estimates in this subcategory focus exclusively on the incremental cost of the materials required to produce the floorboard solution.

  - Cost of Installation of the Floorboard Solution

Staff assumed that the installation cost of the floorboard solution closely matches the installation cost of the original floorboard. Therefore, the incremental installation cost is negligible.

- Cost of Government Oversight and Compliance Monitoring.

Staff does not expect the implementation of the proposed rule to require significant resources or additional oversight and compliance monitoring by CPSC. CPSC can reasonably provide oversight and monitoring of the new ROV/UTV floorboard requirements with existing resources. Therefore, staff assumed the additional cost incurred by the government to provide additional oversight and compliance monitoring to be of an insignificant magnitude, and thus, it is not addressed further in this analysis.

[13] The floorboard solution can be fabricated in-house by the manufacturer or by a third party contractor hired by the manufacturer.

- Deadweight Loss.

The requirements for ROVs/UTVs in the proposed rule increase the marginal cost of production for manufacturers. Manufacturers can transfer some, or all, of the increased production cost to consumers through price increases.[14] [15]

At the margins, some producers of a product may exit the market as a result of production cost increases where their increased marginal costs come to exceed the market price. At the same time, a fraction of consumers of that product are excluded from the market because the increased market price now exceeds their personal price threshold for purchasing. Deadweight loss[16] is the measure of the losses faced by these marginal producers and consumers, who are forced out of the market due to the new requirements of the proposed rule. For this analysis, staff estimated deadweight loss for each year the proposed rule is expected to have an impact on marginal cost

[14] An increase in the marginal cost of production in a competitive market normally is followed by an increase in the prices at which products are traded. The portion of the increased production costs that are paid for by consumers through higher market prices depends on the price responsiveness of demand and supply of the product. The price responsiveness of demand and supply are measured by the price elasticity of demand and supply, respectively. Price elasticity is a measure of how responsive the volume of product demanded or supplied in the market is to a change in the price of such product. Price elasticity is estimated as the ratio of the percentage change in the volume demanded or supplied as a result of a percentage change in price, or $\varepsilon=\Delta\%Q\Delta\%P/\varepsilon=\Delta\%Q\Delta\%P$. For most products, the elasticity of demand is a negative number that indicates price increases lead consumers to demand less of the product; while the elasticity of supply is a positive number that indicates an increased willingness to offer products in the market as the price of the product increases.

[15] More precisely, the change in the market price of equilibrium (P_1 - P_0) that follows an increase in production costs (C_p) in a competitive market can be estimated as $P1-P0= \Delta Cp(\varepsilon s\varepsilon s-\varepsilon d)P1-P0= \Delta Cp\varepsilon s\varepsilon s-\varepsilon d$, where ε_s is the elasticity of supply and ε_d is the elasticity of demand. In a market with a completely inelastic demand ($\varepsilon_d = 0$), producers can transfer the entire change in the cost of production to consumers through price increases. The highest the elasticity of demand, the lowest the portion of the increased production costs that can be transferred to consumers through price increases.

[16] The deadweight loss (DL) is estimated as $DL=(Q0-Q1)\Delta Cp2DL=Q0-Q1\Delta Cp2$, where Q_0 is the expected market volume absent the proposed rule, Q_1 is the expected market volume after the impacts of the rule, and ΔC_p is the average long-term change in the cost of production. Q_0 -the expected market volume absent the proposed rule-is forecasted for each year in the time horizon of the analysis using ROV/UTV market volume trends from the North American Utility Vehicle Sales from 2005 to 2019. Q_1 -the expected market volume after the impacts of the rule-is estimated from Q_0, the average price, price elasticities of demand and supply, and the change in the cost of production using the following formula: $Q1=Q0(1+\Delta CpP0\varepsilon s\varepsilon d\varepsilon s-\varepsilon d)Q1=Q01+\Delta CpP0\varepsilon s\varepsilon d\varepsilon s-\varepsilon d$. The average long-term variable cost of production is estimated spreading large one-time costs--such as the cost of redesigning all existing ROV/UTV models within a short period of time--over the planning horizon of the analysis and adding this estimate to the average annual short-term variable cost. To assess the effective market impact of the proposed rule, ΔC_p also includes a markup of 38 percent to cover the wholesalers' distribution costs (see Goldberg, Pinelopi 1995).

and market price. The estimate assumes that producers based their production decisions on the long-term impacts of the rule on their cost of production.

The following two subsections present the cost estimates for each of the two scenarios for compliance with the proposed rule.

1. First Compliance Scenario: The Cost of Redesigned Floorboards

This subsection presents cost estimates for the scenario that assumes all manufacturers install a fully redesigned floorboard on each new ROV/UTV to comply with the proposed rule. Manufacturers would also redesign all existing and future ROV/UTV models to allow proper installation of the redesigned floorboards.

a) Cost of Redesigning ROV/UTV Models

Staff estimated the cost of redesigning all existing ROV/UTV models by multiplying the unit cost of redesigning each existing model by the number of ROV/UTV models to be redesigned. These factors are discussed in more detail below. As discussed earlier, the additional design cost to enable the installation of the redesigned floorboards on new ROV/UTV model designs is considered negligible; therefore, this section only presents cost estimates for the redesign of existing ROV/UTV models.

i. Unit Cost of Redesigning ROV/UTV Models

Staff estimated the unit cost of redesigning existing ROV/UTV models in two steps. First, staff estimated the unit cost of redesigning a single or "first" model, before achieving any cost improvements.[17] Second, staff developed a cost improvement curve to account for

[17] The design costs per ROV/UTV model are expected to decrease as the number of redesigned ROV/UTV models increases (*i.e.*, fixed costs spread over additional models, increased level of experience redesigning ROV/UTV models).

economies of scale in the redesign of a large number of models, and the efficiency gains from specialization and learning.

Staff estimated the unit cost of the "first" model using information from multiple sources, including laboratory tests performed to measure speeds and energy levels at which debris penetrate ROV/UTV floorboards.[18] CPSC staff produced estimates of the cost of redesigning a ROV/UTV at each stage of the design process:

- Cost of Design Labor

Staff estimated it would require a team of two designers 1 month to produce a final blueprint of an ROV/UTV model design that complies with the requirements of the proposed rule, or approximately a total of 347 hours.[19] The average compensation rate of a designer is $63.96 per hour[20] for a total cost of $22,536 per redesigned model in 2021 dollars.

- Cost of Design Production

Staff estimated the cost of fabrication of each floorboard at $2,000 per floorboard prototype. Staff estimated an average of three floorboard prototypes would be required per model redesign for a total production cost of $6,000 per model.

- Cost of Design Validation

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[18] CPSC Study of Debris Penetration of Recreational Off-Highway Vehicle Floorboards conducted under contract by SEA Ltd., in 2020/2021.
[19] CPSC staff estimated it would take up to two-person months to modify an existing ROV/UTV model that does not comply with the requirements of the proposed rule, with a maximum of 4 months and a minimum of 1 month. Source: Notice of Proposed Rulemaking to Establish a Safety Standard for Recreational Off-Highway Vehicles. September 2014. This is 346.67 hours, the average number of hours per month of 173.33 (40 hours a week x 52 weeks a year/12 months) times 2 (two-person months).
[20] As of September 2021, the average total hourly compensation for management, professional, and related workers was estimated at $63.96 (Bureau of Labor Statistics, Table 2 - Employer Costs for Employee Compensation for Civilian Workers by Occupational and Industry Group, https://www.bls.gov/news.release/ecec.t02.htm). The total cost for two-person months as of September 2021 is $22,172.8 (346.67 hours times $63.96). Adjusted by the CPI price index, this estimate increases to $22,535.89 ($22,172.8 x 278.802 / 274.31) as of December 2021 (Bureau of Labor Statistics – Consumer Price Index for All Urban Consumers, Series ID CUUR0000SA0, 1982-84 base period, https://data.bls.gov/cgi-bin/surveymost?cu).

Staff estimated 2 days of validation testing would be required per each redesigned ROV/UTV model for a total of $59,372 per model.[21]

- Cost of Compliance Testing

Staff estimated that, on average, two ROV/UTV models would be tested per day of sled testing or $14,843 per redesigned model.[22]

Based on the unit costs, the total "first" model cost per redesigned ROV/UTV model is $102,751.[23] This estimate is before the consideration of cost improvements from economies of scale and learning in model design.[24] To account for cost improvements, as the number of ROV/UTV models that are redesigned increases, staff used a cost improvement curve. The improvement curve assumes that every time the number of units produced doubles, there is a 5.4 percent reduction in the average redesign cost per ROV/UTV model.[25]

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[21] As part of the CPSC study on debris penetration, SEA Ltd., conducted a total of 5 days of validation testing for a total cost of $138,570, or $27,714 per day as of September 2020. The cost of 2 days of testing brought forward to the end of 2021, using the CPI price index for all urban consumers, is $59,732.36 ($27,714 per day x 2 days x 278.802 / 260.28).

[22] The cost of validation testing from the CPSC contract with SEA Ltd., is $27,714 per day as of September 2020. CPSC staff estimates a total of three validation tests can be performed per day of third-party validation testing; however, the logistics involved in validation testing may reduce it to an average of two tests per day. The cost per model in dollars as of the end of 2021 is then $14,843 ($27,714 per day/2 models per day x 278.802 / 260.28).

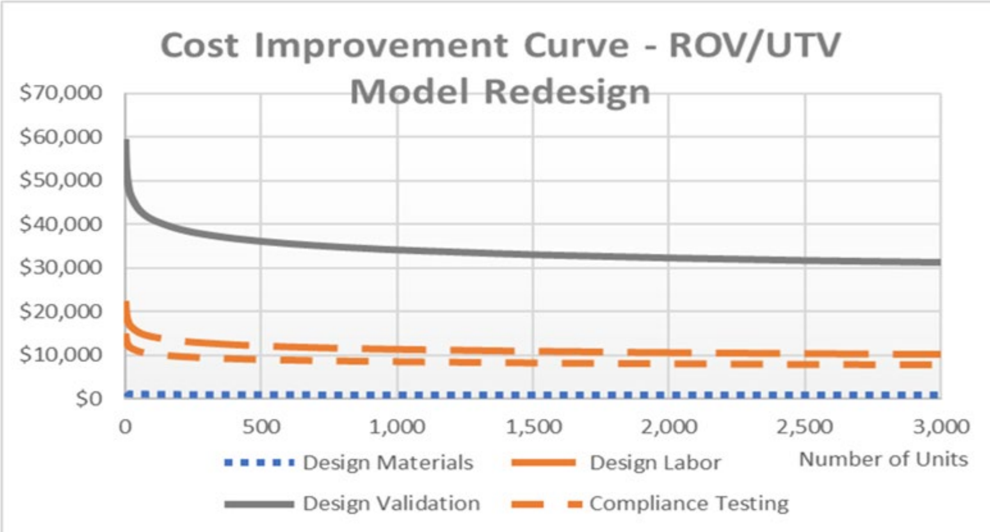
[23] $102,751.34 = $22,535.89 (labor cost) + $6,000 (floorboard fabrication) + $59,372.36 (validation testing) + $14,843.09 (compliance testing).

[24] The traditional definition of "learning curves" —or more properly in this case, "cost improvement curves"—is centered on the observation that the cost per unit is reduced by a certain percentage every time the number of units produced doubles. The most cited models are derived from T.P. Wright (1936 - cumulative average unit cost) and J.R. Crawford (1944 - specific unit cost). The functional form in both of these models is:
C(X)=AX∝C(X)=AX∝
, where C(X) is the cost function at level of production X, A is the cost of the first (theoretical) unit, X is the number of units produced, and α is the slope. In Wright's model, C(X) is the cumulative average cost (the form used here); while in Crawford's model, C(X) is the cost of the last unit produced.

[25] For simplicity, staff assumed each of the redesign cost categories discussed here follows the same cost improvement trend. The cost improvement curve--or learning curve--used by staff has the following functional form:
C(X)=AX∝C(X)=AX∝
, where C(X) is the cumulative average cost per unit at each level of production, A is the cost of the first (theoretical) unit, X is the number of units produced, and α is the slope. A 5.4% cost improvement implies the value of the slope α is -0.08 (given the function form a doubling in production results in a cost improvement of $1 - 2^{-0.08}$ = 5.39%). Cost improvement curves are usually estimated econometrically using available cost/manufacturing data; however, in the absence of such information, CPSC selected the cost improvement percentage based on cost improvement curves from similar activities and derived the parameters.

Figure 14 shows the cost improvement trends for each of the design cost components discussed earlier:

Figure 14: Redesign Cost Improvement Curve – Scenario I (Redesign Floorboards)



The trends in the chart show that when manufacturers redesign 3,000 ROV/UTV models in a particular year, the average redesign cost per model in that year would reach almost half the redesign cost of the "first" model (overall a cost of around $52,000 per model).

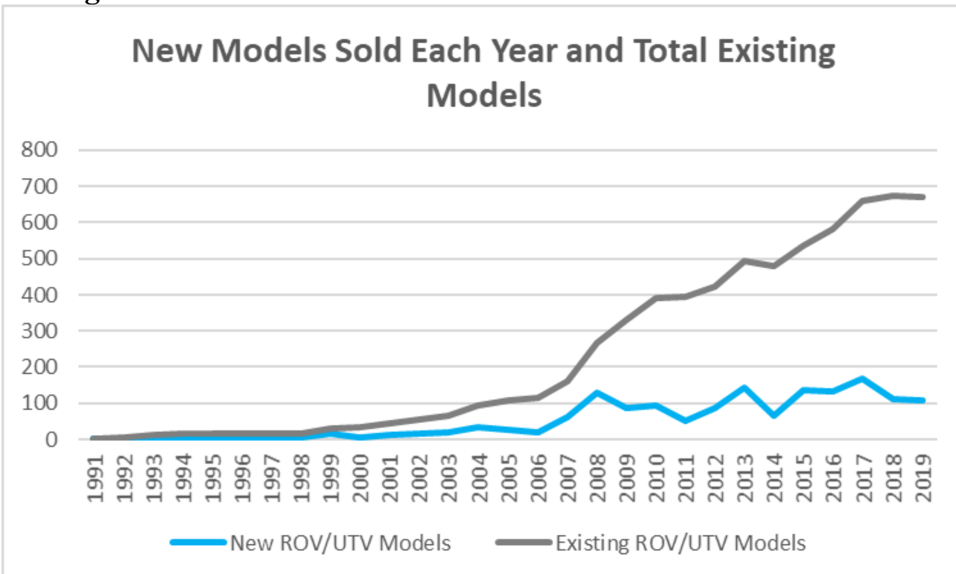
Since the redesign cost of models varies with the number of models redesigned each year, it is pertinent to discuss–before the discussion of unit cost per model–the forecasted the number of models.

ii. Number of Redesigned ROV/UTV Models

Figure 15 shows the number of new models sold during the period 1991 through 2019, as well as an estimate of the total number of ROV/UTV models in use by consumers during the same period.[26] For instance, in 2019, a total of 107 new models were introduced; the same year, an estimated 672 models were in use by ROV/UTV owners/users.

[26] The number of models sold in each year of this period was estimated using the North American Utility Vehicle Sales from 1991 to 2019. It excludes ROV/UTV models designed for the use of children (*i.e.*, "Minis").

Figure 15: Number of Models for Sale and Total Models in Use



Staff forecasted the number of new models every year in the 30-year study period by applying exponential smoothing forecasting techniques[27] to the number of new models produced.[28] Then, staff used the forecast of the number of models to estimate how many models would be in use in every year in the 30-year study period by applying a statistical distribution of model life rates[29] based on the average number of years a model is offered for sale in the market for new ROVs/UTVs.

[27] Exponential smoothing is a time series forecasting technique that produces projections that are weighted averages of past observations, with weights that decay exponentially as the observations get older. More recent observations are, therefore, assigned heavier weights and carry more importance in the forecast.
[28] CPSC staff developed two sets of forecasts, the first set (or baseline forecast) assumes no impacts from the proposed rule, while the second set considers a small reduction in the number of models as a result of the market impacts of introducing the proposed rule. Because the cost impacts of the proposed rule are relatively small, the difference between the two sets of forecasts are small and not noticeable in the chart below.
[29] A two-parameter gamma distribution was used to forecast model survival rates with a shape parameter of 5 and scale parameter of 1. These distribution parameters are consistent with a mean model duration of 5 years, which was estimated subtracting the year of model introduction from the year the model was discontinued from the North American Utility Vehicle Sales database. The distribution of model life rates mentioned above is the converse of the distribution of model survival rates.

Figure 16: Forecast of Models for Sale and Total Models in Use

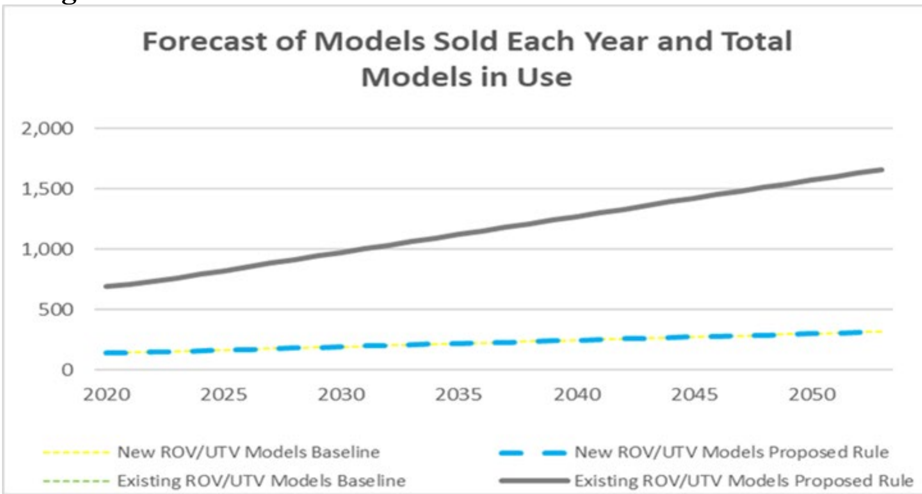


Figure 16 shows the number of new models sold and the number of models in use during each year within the 30-year study period. In 2023, a year before the assumed implementation of the proposed rule, the number of ROV/UTV models in use is 762. This is the number of existing models that manufacturers would be required to redesign.[30] Staff assumed for purposes of this analysis that redesign of all existing models would occur over 2 years, from 2024 to 2025, at 381 models per year. Although the proposed effective date for the draft rule is 180 days after promulgation, staff assumed manufacturers would prioritize redesigning the most popular models before the effective date, while stockpiling units for other models whose redesign would occur after the effective date. Staff welcomes public comment on the redesign process of ROV and UTV models and the rapidity with which this is able to occur.

Due to cost improvements associated with redesigning a relatively large number of ROV/UTV models, (381) in each of the first 2 years, staff estimated the initial cost per model redesign to drop from $102,751 to an average of $53,877 each year. Therefore, the industry

[30] Starting on the year of implementation of the rule (expected in 2024), all existing and new models will have to include a floorboard solution that complies with the requirements of the new standard to be sold to new/prospective ROV/UTV customers. Given the incremental cost of designing new models is negligible, the redesign cost is only estimated for existing models requiring new blueprints that enable the installation of the redesigned floorboards.

incurs a redesign cost of $20.51 million in 2024 and 2025, respectively. The total redesign costs over the 30-year study period are $41.02 million. The total redesign costs are equivalent to a present value of $39.24 million at a 3 percent discount rate. Table 5 summarizes the ROV/UTV redesign cost under the redesigned floorboard scenario:

Table 5: Redesign Costs in Scenario I (Redesign Floorboards)

Redesigned Floorboard Scenario	Cost per Redesign Model ($M)	Number of ROV/UTV Models	ROV/UTV Redesign Cost ($M)
2024	$0.054	381	$20.51
2025	$0.054	381	$20.51
Overall	$0.054	762	$41.02
Present Value			$39.24

b) Cost of Manufacturing a ROV/UTV Floorboard Solution

Staff estimated the cost of producing and installing[31] redesigned ROV/UTV floorboards on all new ROVs/UTVs manufactured after the implementation of the proposed rule, by multiplying the unit cost of each floorboard by the number of floorboards to be installed. These components are discussed in more detail below.

i. Unit Cost of Redesigning Floorboards

Staff estimated the unit cost of the redesigned ROV/UTV floorboard in two steps. First, staff used unit costs informed by laboratory tests performed to measure floorboard resistance at different speeds, for the additional cost of production and materials as the cost of the "first" redesigned floorboard in the cost improvement curve.[32] Second, staff produced an estimate of the

[31] As discussed, the additional cost of installing redesigned floorboards on new ROVs/UTVs is considered negligible; therefore, this section only presents cost estimates for the additional production costs (more specifically the additional materials) of the redesigned floorboards.
[32] The traditional definition of "learning curves" —or more properly in this case "cost improvement curves"—is centered on the observation that the cost per unit is reduced by a certain percentage every time the number of units produced doubles. The most cited models are derived from T.P. Wright (1936 - cumulative average unit cost) and J.R. Crawford (1944 - specific unit cost). The functional form in both of these models is:
$C(X)=AX^{\propto}C(X)=AX^{\propto}$

average additional cost per floorboard once manufacturers started producing compliant floorboards in large quantities; the cost-improvement curve to render estimates in line with the subject matter experts in CPSC's Directorate for Engineering assessed would be the cost after economies of scale take effect.

Staff estimated the incremental cost of the "first" ROV/UTV floorboard using information from laboratory tests performed to measure debris penetration resistance of ROV/UTV floorboards. Staff estimated the cost of a floorboard resistant to debris penetration at 10 mph to be $264.[33] Staff then produced an estimate of the cost of the redesigned floorboard considering cost improvements from economies of scale, as well as other considerations, like the reuse of most of the material contained in existing floorboards. The average incremental cost per floorboard under these conditions is not expected to exceed $10 per floorboard.

Staff calibrated a cost improvement curve that assumes each time the number of floorboards produced doubles, there is a 15.9 percent reduction in the average floorboard cost.[34] Figure 17 shows the cost improvement curve at different scales of floorboard production:

, where C(X) is the cost function at level of production X, A is the cost of the first (theoretical) unit, X is the number of units produced, and α is the slope. In Wright's model, C(X) is the cumulative average cost (the form used here); while in Crawford's model, C(X) is the cost of the last unit produced.

[33] CPSC Study of Debris Penetration of Recreational Off-Highway Vehicle Floorboards conducted under contract by SEA Ltd., in 2020/2021. SEA tested multiple floorboards, a floorboard that successfully resisted debris penetration at 10 mph was purchased for $259 in August 2021. This estimate was brought forward to the end of 2021, using the Consumer Price Index for all Urban Consumers ($263.96 = $259 x 278.802 / 273.567).

[34] A 15.9 percent cost improvement implies the value of the slope α is -0.25 (given the function form a doubling in production results in a cost improvement of $1 - 2^{-0.25} = 15.91\%$).

Figure 17: Prod/Materials Cost Improvement Curve - Scenario I (Redesigned Floorboards)

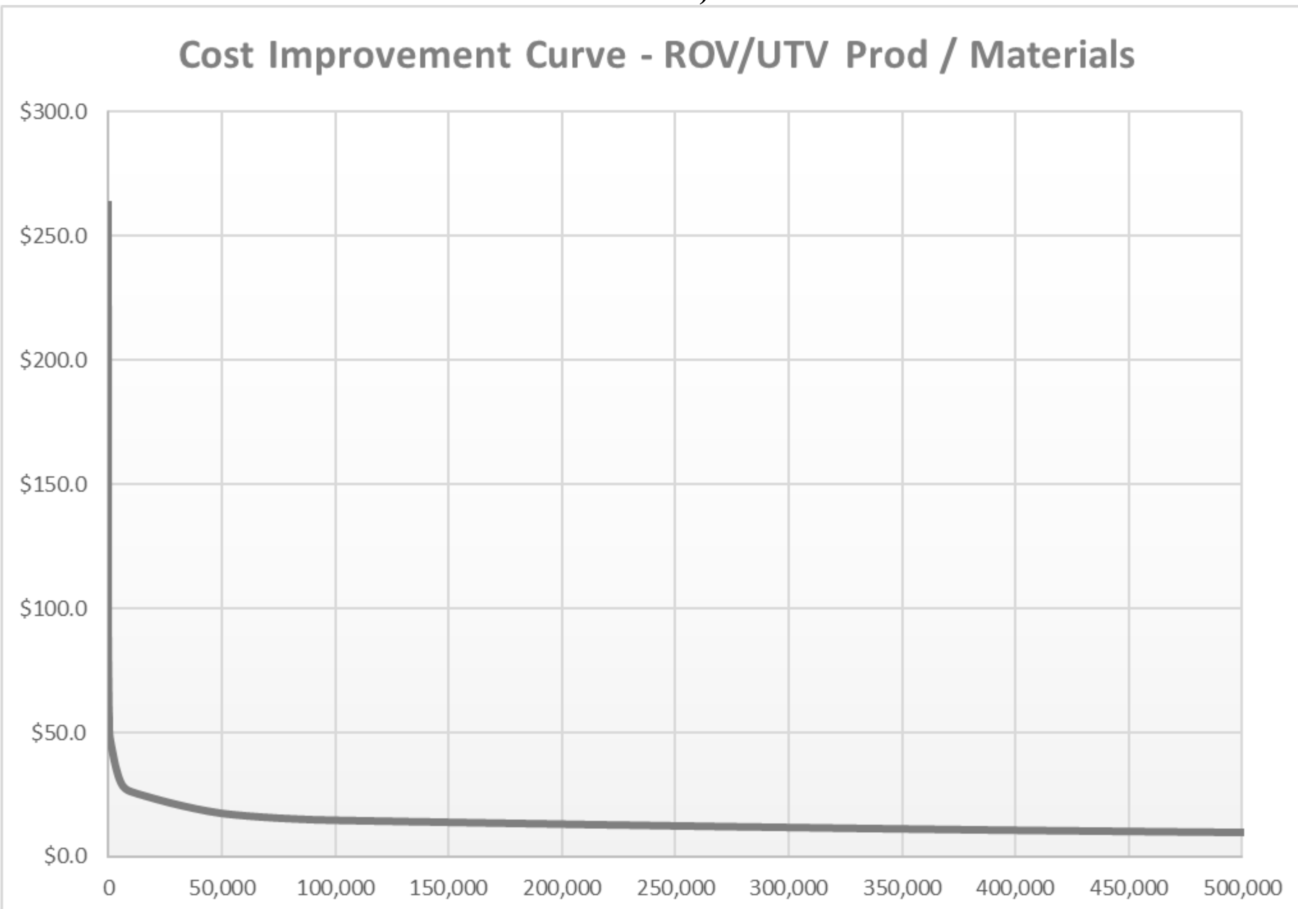
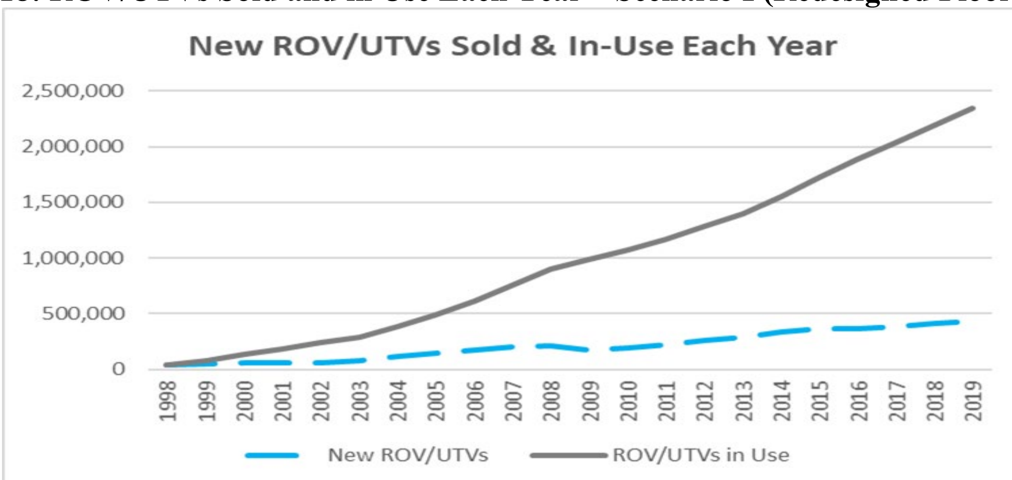


Figure 17 shows that with 100,000 floorboards produced, the average cost drops to less than $15 per redesigned floorboard. In most years, sales of new ROV/UTVs are above 500,000 units, which the cost improvement curve correlates to an average additional cost of less than $10 per redesigned floorboard. The average floorboard cost is, as shown in the chart, dependent on the number of sales per year, which is discussed below.

ii. Number of ROVs/UTVs Sold

Figure 18 shows the number of new ROVs/UTVs sold during the period 1998 through 2019, as well as an estimate of the total number of ROVs/UTVs in use during the same period.[35] During 2019, firms sold 429,135 new ROVs/UTVs to consumers, and the number of ROVs/UTVs in use during the same year averaged 2.34 million.

Figure 18: ROV/UTVs Sold and in Use Each Year – Scenario I (Redesigned Floorboards)



Staff used exponential smoothing techniques to forecast the number of new ROV/UTV sales within the 30-year study period.[36] Staff also forecasted the number of ROVs/UTVs in use by applying a statistical distribution of product life rates[37] to the fleet.

[35] Staff estimated the number of ROVs/UTVs sold each year during the period 1998 to 2019, using the North American Utility Vehicle Sales database. For the purpose of the analysis, the number of vehicles excludes ROVs/UTVs sold for the use of children (*e.g.,* ROV/UTV "Minis").

[36] CPSC staff developed two sets of ROV/UTV forecasts, the first set (or baseline forecast) assumes no impacts from the proposed rule, while the second set considers a small reduction in the number of ROVs/UTVs from the market impacts of the proposed rule. Because the cost impacts of the proposed rule are relatively small, the difference between the two sets of forecasts is small and not noticeable.

[37] A two-parameter gamma distribution was used to forecast ROV/UTV survival rates with shape parameter of 6 and scale parameter of 1 corresponding to a mean ROV/UTV duration of 6 years. The distribution of product life rates mentioned in the paragraph above is the reciprocal of the distribution of survival rates.

Figure 19: Forecast of ROV/UTVs Sales and ROV/UTVs in Use – Scenario I (Redesigned Floorboards)

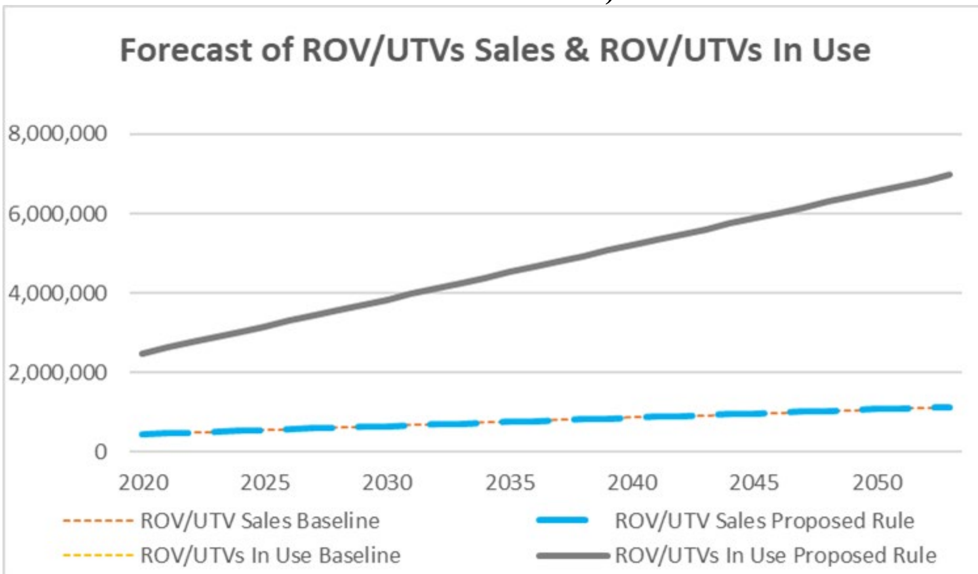
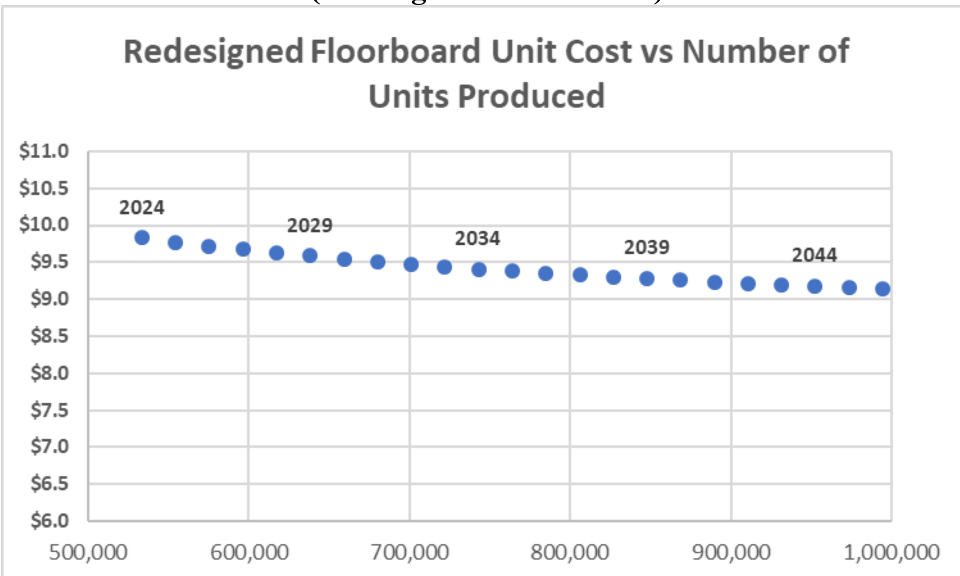


Figure 19 shows ROVs/UTVs sales and the number of ROVs/UTVs in use during the 30-year study period. Since each new ROV/UTV sold requires a redesigned floorboard, the number of floorboards to be fabricated is equivalent to the number of units sold during the period 2024 to 2053. Figure 20 shows the number of floorboards produced over time and the corresponding (undiscounted) cost per unit.

Figure 20: Redesigned Floorboard Unit Cost by Production Volume – Scenario I (Redesigned Floorboards)



The total cost of producing and installing redesigned floorboards in every new ROV/UTV is $227.09 million over the 30-year study period. The equivalent present value at a 3 percent discount rate is $142.15 million. Table 6 summarizes these costs:

Table 6: Additional Cost of Floorboards on ROV/UTVs – Scenario I (Redesigned Floorboards)

Redesigned Floorboard Scenario	Average Cost per Redesigned Floorboard ($)	Millions of New ROVs/UTVs with Redesigned Floorboards	Cost of Redesigned Floorboards on ROVs/UTVs ($M)
2024 - 2053	$9.04	25.12	$227.09
Present Value			$142.15

The total cost of implementing the redesigned floorboard fix for debris penetration is summarized in Table 7:

Table 7: Redesign and Production Cost – Scenario I (Redesigned Floorboards)

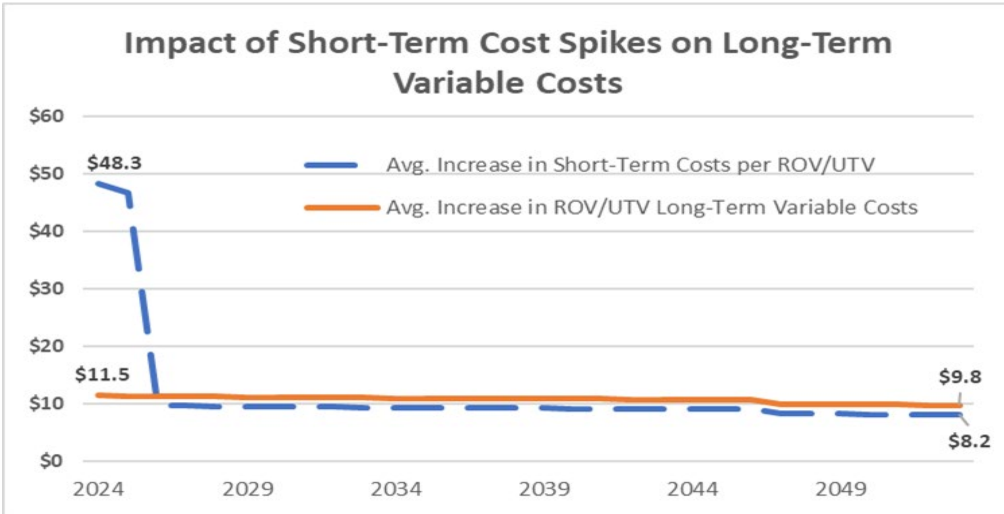
Cost of Redesigned Floorboard Fix	Average Cost per ROV/UTV ($)	Millions of New ROVs/UTVs	Cost of Redesigned Floorboards ($M)	Present Value ($M)
Cost of Redesigning Existing Models	$1.63	25.12	$41.02	$39.24
Cost of Producing Redesigned Floorboards	$9.04	25.12	$227.09	$142.15
Cost of Redesigning Floorboard Fix	**$10.67**	**25.12**	**$268.11**	**$181.39**

c) Deadweight Loss

To produce an estimate of the market-related losses to producers and consumers, staff estimated the annual average increased cost of production, the resulting increase in average prices, and reduction in volumes traded in the ROV/UTV market. Staff then used those estimates to calculate the deadweight loss for each year in the 30-year study period.

Staff assumed that manufacturers would increase prices in response to changes in the average long-term variable costs of producing ROVs/UTVs. Staff calculated the expected changes in long-term variable costs by spreading the spikes in short-term costs from complying with the proposed rule, as shown in Figure 21:

Figure 21: Long-Term Impact of Short-Term Cost Spikes – Scenario I (Redesigned Floorboards)

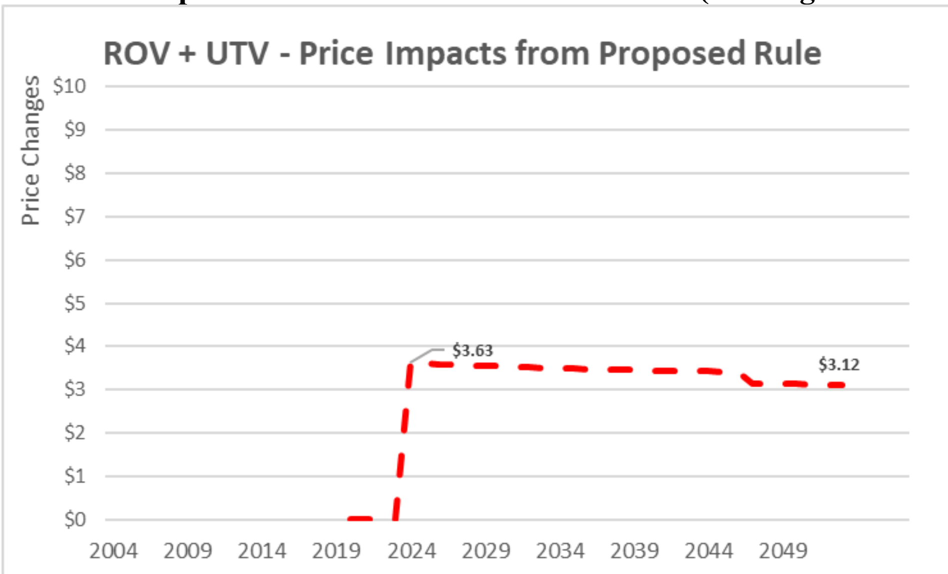


Staff augmented the average long-term cost per ROV/UTV redesigned floorboard shown in Figure 19 by a 38 percent[38] wholesaler distribution markup. This simulates the market impact that the proposed rule has on the ROV/UTV supply curve.

Staff adjusted the average annual prices from the period 2004 to 2019,[39] to constant 2021 dollars,[40] and then forecasted prices for the 30-year study period using exponential smoothing. The charts in Figure 22 show the prices in baseline conditions (assuming no proposed rule in effect) forecasted through 2053, as well as the price impacts of the proposed implementation of the rule.

[38]The effective market impact is likely to include a markup to cover the wholesalers' distribution costs. The 38 percent markup comes from Goldberg 1995.
[39] Average annual prices were estimated using the North American Utility Vehicle Sales database. Prices of ROV/UTV designed for the use of children were excluded from the weighted price average.
[40] Prices were brought forward using the Consumer Price Index for All Urban Consumers from the Bureau of Labor Statistics.

Figure 22: Price Impacts from the Rule Under Scenario I (Redesigned Floorboards)



The impact of the rule on the ROV/UTV price is very small, accounting for less than 0.03 percent of the average market price.[41] Consequently, the change in market volume is also very small. The small price and quantity impacts result in deadweight losses under $6,000 per year, and aggregate to approximately $160,000 over the 30-year study period. In the context of this proposed rule, deadweight loss is not a significant cost and is likely to be masked by other economic factors.

d) Total Cost Under First Compliance Scenario: Redesigned Floorboard

Table 8 summarizes the cost of the first compliance scenario: the design and production of redesigned floorboards.

[41] The price impact is estimated with the formula $\Delta P= \Delta Cp(\varepsilon s\varepsilon s-\varepsilon d)\Delta P= \Delta Cp\varepsilon s\varepsilon s-\varepsilon d$, which, in this specific context, means the change in price equals the change in long-term average cost (including a markup), times the ratio of the elasticity of supply to the difference between elasticity of supply and demand. Using the average change in production cost of $10.67, plus a 38 percent markup for distribution, Cp equals $14.73. The elasticity of supply and demand are estimated using the automobile vehicle market as a proxy (Goldberg, P) at 1.1 and -3.69, hence, $\Delta P=\$14.73(1.11.1-(-3.69))=\$3.4\Delta P=\$14.731.11.1--3.69=\$3.4$. This estimate differs slightly from the yearly estimates shown in the chart, because the change in unit cost vary from year to year.

Table 8: Total Cost of ROV/UTV Fix - Scenario I (Redesigned Floorboards)

Cost of Redesigned Floorboard Fix ($M)	Total Cost	Present Value
Cost of Redesigning Existing Models	$41.02	$39.24
Cost of Production of Redesigned Floorboards	$227.09	$142.15
Deadweight Loss	$0.16	$0.10
Cost of First Compliance Scenario	**$268.26**	**$181.49**

2. Second Compliance Scenario: The Cost of a Floorboard Guard

This subsection presents cost estimates for the scenario that all manufacturers produce and install a floorboard guard under the floorboard to comply with the proposed rule. Manufacturers would redesign floorboards to add a 2' x 2' x 0.19" aluminum piece that can prevent debris penetration. Manufacturers would also have to redesign all existing and future ROV/UTV models to allow proper installation of the floorboard guard.

a) Cost of Redesigning ROV/UTV Models

Staff estimated the cost of redesigning all existing ROV/UTV models to allow for the installation of floorboard guards by multiplying the unit cost of redesigning each existing model[42] by the number of ROV/UTV models to be redesigned. These two cost elements are discussed in more detail below.

i. Unit Cost of Redesigning ROV/UTV Models

Like the estimation method used with the first compliance scenario, staff estimated the unit cost of redesigning existing ROV/UTV models in two steps. First, staff estimated the unit cost of redesigning a single or "first" model before cost improvements. Second, staff developed a

[42] The additional design cost to enable the installation of the floorboard guards on new ROV/UTV model designs is considered negligible. This section focuses only in the costs of redesigning existing ROV/UTV models.

cost improvement curve to account for the diminishing cost of redesigning through economies of scale.[43]

Staff developed the unit cost of the "first" ROV/UTV model redesign from related studies and reports, including a set of laboratory tests performed to measure floorboard resistance at different speeds.[44] Staff produced unit cost estimates for four stages in the design process:

- Cost of Design Labor

Staff estimated it would take two designers 1 month to produce final blueprints, or approximately 347 hours.[45] The average compensation rate for a designer is $63.96 per hour for a total cost of $22,536 per redesigned ROV/UTV model in 2021 dollars.[46]

- Cost of Design Production

Staff used information from its study on debris penetration[47] to produce an estimate of the cost per floorboard prototype at $500. Assuming an average of three floorboard prototypes per ROV/UTV model redesign, staff estimated a total production cost of $1,500 per redesigned model.

- Cost of Design Validation

[43] Costs improvements are expected as fixed costs spread over additional model redesigns, and the level of experience and specialization redesigning ROV/UTV models for floorboard debris penetration increases.
[44] CPSC Study of Debris Penetration of Recreational Off-Highway Vehicle Floorboards conducted under contract by SEA Limited in 2020/2021.
[45] CPSC staff estimated each redesign would take up to two-person months, with a maximum of four months and a minimum of one month (Notice of Proposed Rulemaking to Establish a Safety Standard for Recreational Off-Highway Vehicles. September 2014). Two-person months are equivalent to 346.67 hours: the average number of hours per month of 173.33 (40 hours a week x 52 weeks a year/12 months) times 2.
[46] The average total hourly compensation for management, professional, and related workers was estimated as of September 2021 at $63.96 (BLS, https://www.bls.gov/news.release/ecec.t02.htm). The total cost for two-person months as of September 2021 is then $22,172.8 (346.67 hours times $63.96). Adjusted by the CPI price index, this estimate increases to $22,535.89 ($22,172.8 x 278.802 / 274.31) as of December 2021 (CPI-U, ID: CUUR0000SA0, https://data.bls.gov/cgi-bin/surveymost?cu).
[47] Conducted by SEA Limited under contract with CPSC (Debris Penetration of ROVs Floorboards).

Staff estimated 2 days of validation testing per each redesigned ROV/UTV model for a total of \$59,372.[48]

- Cost of Compliance Testing

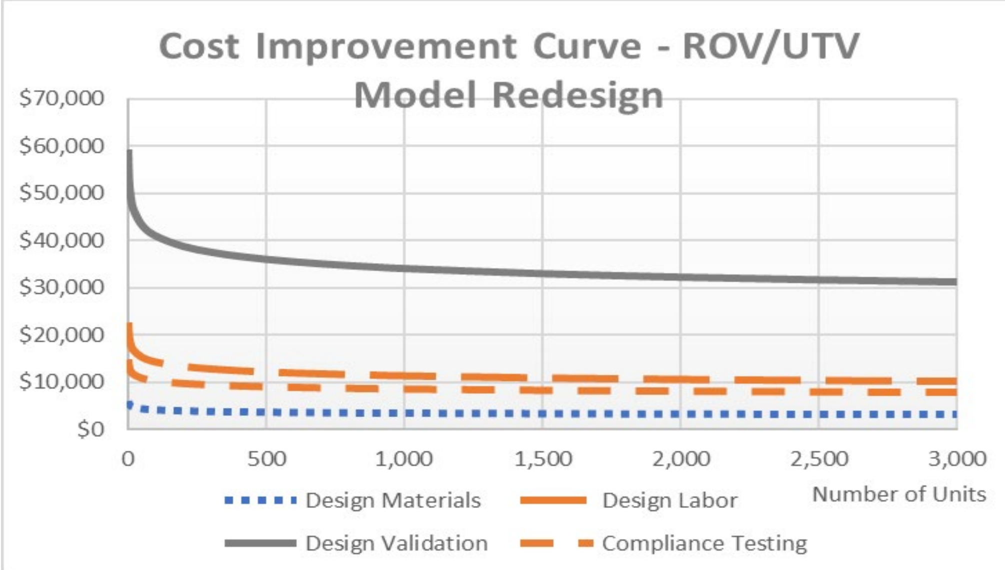
Staff estimated that, on average, two ROV/UTV models would be tested using the test sled method at \$14,843 per model.[49]

Based on these inputs, staff estimated the total cost per "first" redesigned model is \$98,251.[50] This is before considering the cost improvement from scale, specialization, and learning. Staff then used a cost improvement curve that calculates a 5.4 percent reduction in per-unit cost every time the number of units redesigned doubles.[51]

Figure 23 shows the cost improvement trends for each of the design cost components discussed earlier:

[48] Ibid. SEA Ltd., conducted 5 days of validation testing for a total cost of \$138,570, or \$27,714 per day as of September 2020. The cost of 2 days of testing brought forward to the end of 2021, using the CPI price index for all urban consumers, is \$59,732.36 (\$27,714 per day x 2 days x 278.802 / 260.28).
[49] The cost per day of sled testing, as provided by SEA Ltd., was \$27,714 as of September 2020. CPSC staff estimates that, on average, two models would be tested per day. The cost per model as of the end of 2021 is then \$14,843 (\$27,714 per day/2 models per day x 278.802/260.28).
[50] \$98,251.34 = \$22,535.89 (labor cost) + \$1,500 (floorboard fabrication) + \$59,372.36 (validation testing) + \$14,843.09 (compliance testing).
[51] CPSC staff assume the same cost trends for each design cost category. The slope of the cost improvement curve $C(X)=AX^{\propto}C(X)=AX^{\propto}$ was estimated at $\alpha = -0.08$ (a doubling in production results in a cost improvement of $1 - 2^{-0.08} = 5.39\%$).

Figure 23: Redesign Cost Improvement Curve – Scenario II (Floorboard Guards)



The average redesign cost per model is dependent on the number of models redesigned each year, which is discussed in the following section.

ii. Number of Redesigned ROV/UTV Models

Staff used the same forecast of the number of new models introduced each year and number of models in use by consumers for this compliance scenario as in the redesigned floorboard scenario.[52] The baseline data in 2019 reveals 107 new ROV/UTV models introduced and 672 existing ROV/UTV models used by consumers.

Staff used the baseline forecast of the number of new models to produce an estimate of new models that would need to be redesigned under the proposed rule.[53] Then, staff used the

[52]The same baseline number of models is used for both compliance scenarios (see baseline data and forecast in the corresponding section of the first compliance scenario -"redesign floorboards"- for additional context). The number of models sold in each year of this period was estimated using the North American Utility Vehicle Sales from 1991 to 2019, excluding models design for children.

[53] CPSC staff developed a second set of forecasts from the baseline forecast by considering the market impacts of the proposed rule. Due to the relatively small cost impacts of the proposed rule, the difference between the two sets of forecasts is not noticeable in the chart.

forecasted number of new models to estimate the number of redesigned models in use every year throughout the 30-year study period by applying a statistical distribution of model life rates.[54]

The forecast matches almost exactly the chart shown in Figure 16 with 762 ROV/UTV models in use in 2023. This value is the number of existing models that manufacturers would be required to redesign.[55] Staff assumed that manufacturers would spread the redesign activities over a period of 2 years, at 381 ROV/UTV models per year. The improvement over the cost of the "first" redesigned model would bring down the average cost per model from $98,251 to an average of $51,042 each year. Consequently, the ROV/UTV industry would incur redesign costs of $19.43 million in 2024 and 2025, respectively, as shown in Table 9:

Table 9: Redesign Costs in Scenario II (Floorboard Guards)

Floorboard Guard Scenario	Cost per Redesigned Model ($M)	Number of ROV/UTV Models	ROV/UTV Industry Cost ($M)
2024	$0.051	381	$19.43
2025	$0.051	381	$19.43
Overall	$0.051	762	$38.87
Present Value			$37.19

b) Cost of Manufacturing ROV/UTV Floorboard Guards

Staff estimated the cost of producing and installing[56] floorboards with floorboard guards on all new ROVs/UTVs by multiplying the additional cost per floorboard guards by the number of new ROVs/UTVs that would have a floorboard guard installed.

[54] As discussed, a two-parameter gamma distribution was used to forecast model survival rates with shape parameter of 5 and scale parameter of 1, consistent with an estimated mean model duration of 5 years. The model life rates distribution is the converse of the model survival rates distribution.

[55] All existing and new models will have to include a floorboard solution--a floorboard guard in this case that complies with the requirements of the new standard-- in order to be sold to new/prospective ROV/UTV customers. However, the additional cost of redesigning new models is considered negligible based on discussions with manufacturers, so the focus of the estimate is on redesigned existing models only.

[56] Like the first compliance scenario, the additional cost of installing floorboard guards in new ROVs/UTVs is considered negligible. The focus of the section is on the additional production costs of floorboard guards (more specifically the additional materials).

i. Unit Cost of Adding a Floorboard Guard

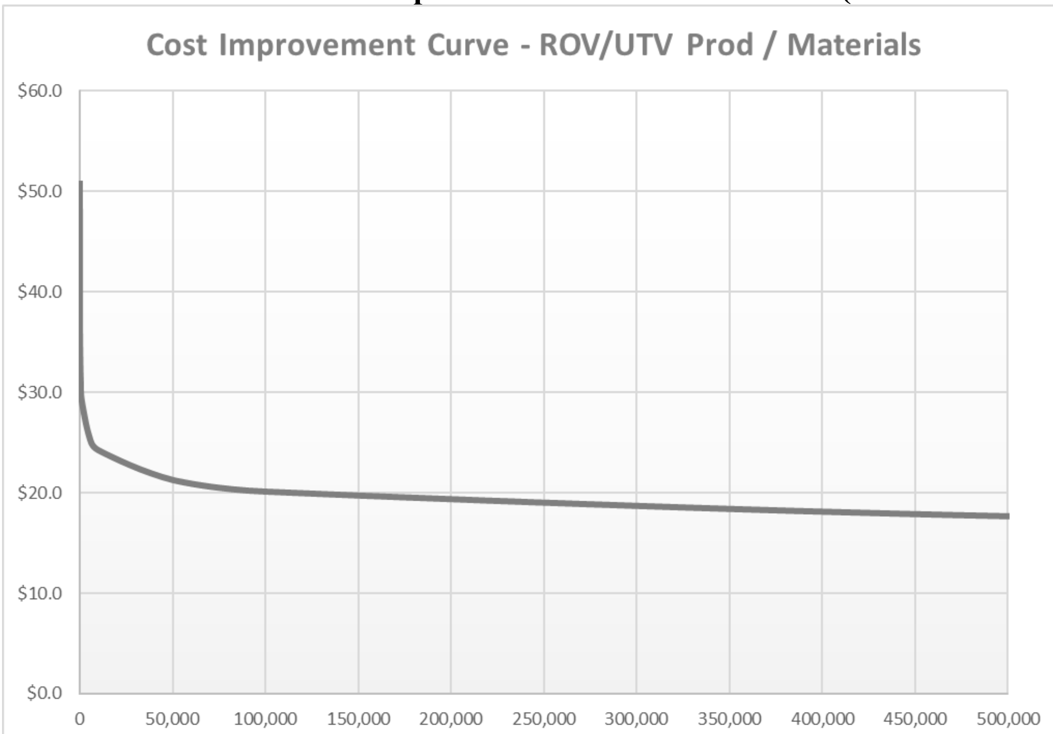
Staff estimated the unit cost of adding floorboard guards to floorboards in two steps. First, staff estimated the additional cost of the "first" floorboard with a floorboard guard in it, before any cost improvements.[57] Second, staff developed an estimate of the average cost of a floorboard using a floorboard guard considering the efficiencies from economies of scale, by calibrating and applying a cost improvement curve.

Staff estimated the incremental cost of the "first" floorboard with a floorboard guard to be $51.09, based on the cost of the materials considering a 2' x 2' x 0.19' aluminum sheet.[58] Staff then applied the cost curve, which calculates a 5.5 percent reduction in average cost every time the number of ROVs/UTVs with a floorboard guard doubles.[59]

Figure 24 shows the cost improvement curve at different scales of production:

[57] Cost improvements are expected due to process improvements and reuse of designs, additional learning and experience in the production process, and economies of scale in the acquisition of materials.
[58] PSC staff estimate this cost applying a 50% manufacturer discount to the Grainger retail price for an aluminum sheet of these characteristics, price at $102.17 as of the end of 2021.
[59] The cost improvement curve with the same functional form as discussed earlier in the document, with a slope α of -0.08. A 5.5% cost improvement implies the value of the slope α is -0.081 (a doubling in production results in a cost improvement of $1 – 2^{-0.081}$ = 5.45%).

Figure 24: Prod/Materials Cost Improvement Curve - Scenario II (Floorboard Guards)



This chart shows that with 100,000 floorboards produced, the cost drops to an average of about $20. In most years, the sales of new ROV/UTVs are greater than 500,000 units, which reduces the average cost to slightly above $17 per new ROV/UTV.

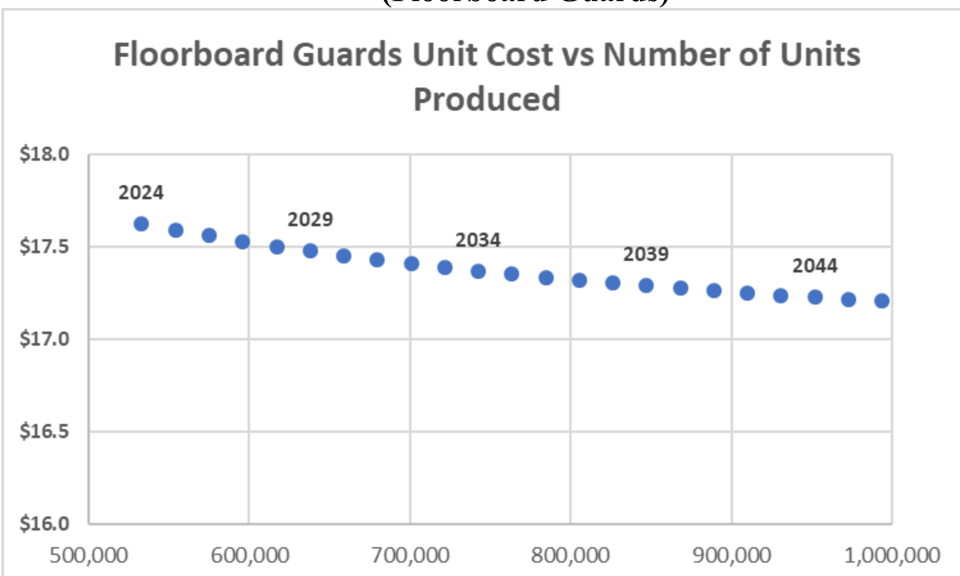
ii. Number of ROVs/UTVs Sold

The baseline forecasts of sale volumes of new ROVs/UTVs and the number of ROVs/UTVs in use by consumers in section VIII.D.1.(a)(ii), Number of Redesigned ROV/UTV Models, are also applicable to this compliance scenario.[60] The baseline data in 2019 show 429,135 new ROVs/UTVs sold and 2.3 million ROVs/UTVs in use by consumers.

[60] The number of ROVs/UTVs sold each year from 1998 to 2019, was estimated using the North American Utility Vehicle Sales database; it excludes ROVs/UTVs sold for the use of children (*e.g.*, the "Mini"). The baseline data and forecasts applied to both compliance scenarios.

Staff used the baseline forecast of the number of new ROVs/UTVs to produce an estimate of new ROVs/UTVs under the proposed rule.[61] Staff also forecasted the number of ROVs/UTVs in use by applying a statistical distribution of product life rates[62] to the total fleet. The forecasted volumes match, almost exactly, the volumes shown in Figure 16. Additionally, Figure 25 shows the number of floorboards produced over time and the corresponding cost per unit.

Figure 25: Additional Floorboard Unit Cost by Production Volume – Scenario II (Floorboard Guards)



To calculate the total incremental cost of producing and installing floorboard guards in every new ROV/UTV over the 30-year study period, staff multiplied the average cost of a floorboard guard by the number of ROVs/UTVs produced. Staff calculated this cost to be $430.33 million.

[61] CPSC staff developed a second set of forecasts subtracting from the baseline forecast of sales the volume impacts of the proposed rule. Due to the relatively small price, and hence, volume impacts of the proposed rule, the difference between the two sets of forecasts is barely noticeable.

[62] A two-parameter gamma distribution was used to forecast ROV/UTV survival rates with a shape parameter of 6 and a scale parameter of 1, corresponding to a mean ROV/UTV duration of 6 years. The distribution of product life rates is the converse of the distribution of survival rates.

The equivalent present value at a 3 percent discount rate is $266.94 million. Table 10 summarizes the cost of producing ROV/UTV floorboards with floorboard guards:[63]

Table 10: Additional Cost of Floorboards on ROV/UTVs – Scenario II (Floorboard Guards)

Floorboard Guard Scenario	Average Cost per Floorboard Guard	Millions of New ROVs/UTVs with Floorboard Guard	Cost of Floorboard Guard ($M)
2024 - 2053	$17.14	25.10	$430.33
Present Value			$266.94

Table 11 summarizes the total cost of implementing the floorboard guards fix to debris penetration over the 30-year study period:

Table 11: Redesign and Production Cost – Scenario II (Floorboard Guards)

Cost of Floorboard Guard Scenario	Average Cost per ROV/UTV	Millions of New ROVs/UTVs	Cost of Floorboard Guard ($M)	Present Value ($M)
Cost of Redesigning Existing Models	$1.55	25.10	$38.87	$37.19
Cost of Producing Redesigned Floorboards	$17.14	25.10	$430.33	$266.94
Cost of Redesigning Floorboard Fix	$18.69	25.10	$469.20	$304.13

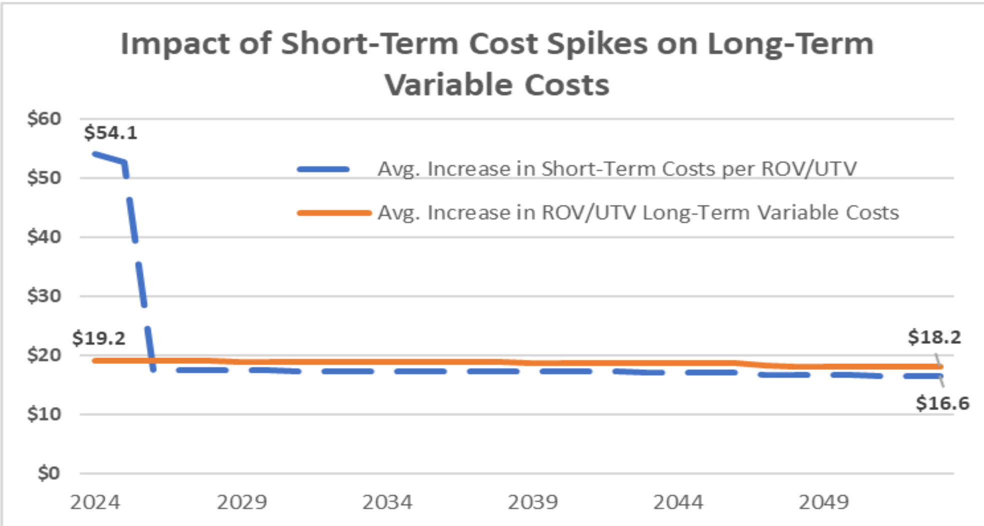
c) Deadweight Loss

Like the first compliance scenario, staff estimated the annual average increased cost of production associated with the new standard, the resulting increase in average prices, and reduction in volumes traded in the ROV/UTV market. Then, staff used those estimates to calculate the deadweight loss for each year of the analysis.

[63] Note that the number of ROVs/UTVs equipped with floorboards containing deflectors shields is slightly below the number of ROVs/UTVs under the first alternative with "redesigned floorboards." The reason for this slight difference is that the implementation of the floorboard guard solution is slightly more expensive, causing a slimly steeper increase in prices, and hence, a slightly reduced sales volume.

Staff calculated the expected changes in long-term variable costs by spreading out the spikes in short-term costs, as shown in Figure 26:

Figure 26: Long-Term Impact of Short-Term Cost Spikes – Scenario II (Floorboard Guards)

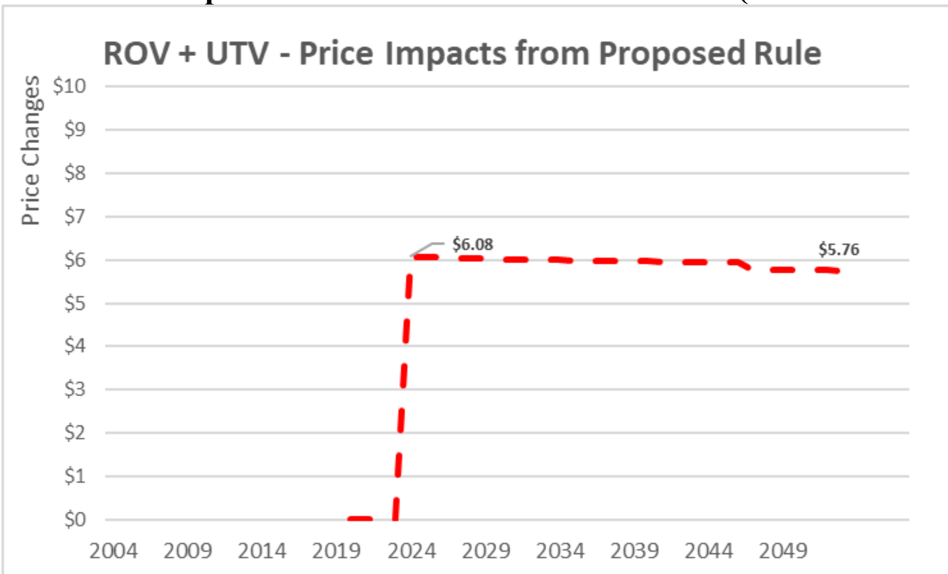


Then, staff augmented the estimated long-term cost presented in Figure 22 by a 38 percent[64] wholesaler distribution markup to simulate the market impact of the proposed rule on the ROV/UTV supply curve.

Staff used the same forecasted baseline prices used in the first scenario–along with price sensitivities of demand and supply–to estimate price impacts of the proposed rule in this scenario.

[64] Goldberg 1995.

Figure 27: Price Impacts from the Rule Under Scenario II (Floorboard Guards)



As Figure 27 shows, the impact of the proposed rule on the ROV/UTV price is slightly higher than in the first compliance scenario, but it is still very small, accounting for less than 0.045 percent of the average market price.[65] Consequently, the change in market volume would also be very small. The small price and quantity impacts result in deadweight losses per year under $20,000, and aggregates to approximately $470,000 over the 30-year study period. In the context of this proposed rule, the impact of deadweight loss is not significant.

d) Total Cost Under Second Compliance Scenario: Floorboard Guards

Table 12 summarizes the total cost of the second compliance scenario over the 30-year study period.

[65] The price impact is estimated with the formula $\Delta P = \Delta Cp(\varepsilon s \varepsilon s - \varepsilon d)\Delta P = \Delta Cp \varepsilon s \varepsilon s - \varepsilon d$. Using the average change in production cost of $18.69, plus a 38 markup for distribution, C_p equals $25.79, and the elasticities of supply and demand for the automobile vehicle market (Goldberg, P) estimated at 1.1 and -3.69, hence, $\Delta P = \$25.79(1.11.1 - (-3.69)) = \$5.9 \Delta P = \$25.791.11.1 -- 3.69 = \$5.9$. This estimate differs slightly from the estimates shown in the chart because unit costs vary from year to year.

Table 12: Total Cost of ROV/UTV Fix - Scenario II (Floorboard Guards)

Cost of Floorboard Guard Fix ($M)	Total Cost	Present Value at 3%
Cost of Redesigning Existing Models	$38.87	$37.19
Cost of Production of Floorboard Guards	$430.33	$266.94
Deadweight Loss	$0.47	$0.30
Cost of Second Compliance Scenario	**$469.67**	**$304.43**

3. Annualized and Per Vehicle, in Use Cost of the Proposed Rule

In this regulatory assessment, staff considered two types of solutions to the debris penetration hazard under the proposed rule: i) fully redesigned floorboards that utilize most of the material in original floorboards, and ii) floorboards with floorboard guards. Both scenarios require manufacturers to redesign existing models to allow for proper installation of the floorboard solution of choice. Staff estimated in each scenario the cost of all firms fully deploying that solution solely. Table 13 below summarizes the aggregate costs of each scenario over the 30-year study period, and their respective present value using a 3 percent discount rate.

Table 13: Total 30-Year Cost of Implementing the Draft Proposed Rule

Cost of Debris Penetration Fix ($M)	Cost of Redesigned Floorboard Scenario	Present Value of Redesigned Floorboards Scenario	Cost of Floorboard Guards Scenario	Present Value of Floorboard Guards Scenario
Cost of Redesigning Existing Models	$41.02	$39.24	$38.87	$37.19
Cost of Production of Redesigned Floorboards	$227.09	$142.15	$430.33	$266.94
Deadweight Loss	$0.16	$0.10	$0.47	$0.30
Cost of Compliance	**$268.26**	**$181.49**	**$469.67**	**$304.43**

The total 30-year cost estimates of the ROV/UTV debris penetration compliance are $268.3 million and $469.7 million, for redesigned floorboards or the floorboard guards, respectively. In practice, manufacturers may choose to implement either solution, or a different solution that proves more cost-effective. The corresponding present values for the 30-year cost range is between $181.5 to $304.4 million.

Using the cost estimates from each scenario, staff calculated the annualized cost[66] and the cost per-product. The average annual cost[67] is $8.94 million for the redesigned floorboards scenario and $15.66 million for the floorboard guard scenario. The annualized costs (annual costs using a discount rate for the time value of money) is $9.26 million at a 3 percent discount

[66] CPSC staff converted the aggregate 30-year costs into present values--an amount in today's dollars that is equivalent to the 30-year stream of costs-by discounting all future amounts at a 3 percent discount rate (a rate that accounts for the time value of money and the opportunity costs). Then, CPSC staff converted these present values into constant annual equivalents, or fixed amounts of cost per year over the 30-year period that represent the constant cost in today's dollars of implementing of the proposed rule.
[67] This is the undiscounted total costs of each compliance alternative divided by 30, the number of years in the period of analysis.

rate for the redesigned floorboards scenario and $15.53 million for the floorboard guard scenario.

Staff estimated per-unit cost by dividing the total cost of the scenario (undiscounted and discounted) by the number of ROVs and UTVs in each compliance scenario over the 30-year period. The total number of ROVs & UTVs with the debris penetration fix is 25.12 million in the redesigned floorboard scenario and 25.10 in the floorboard guard[68] scenario. In the redesigned floorboard scenario, the cost per unit is $10.68 undiscounted and $7.23 discounted at 3 percent. In the floorboard guard scenario, the cost per unit is $18.71 undiscounted and $12.13 discounted at 3 percent.

Table 14 presents the findings from the cost assessment of this proposed rule for both the annualized and per-product perspectives.

Table 14: Average Annual Cost of Draft Proposed Rule Under Each Scenario

Cost of Compliance with Proposed Rule	Average Annual Cost - Undiscounted ($M)	Annualized Cost At 3%($M)	Cost per ROV/UTV – Undiscounted ($)	Cost per ROV/UTV – Discounted at 3% ($)
Scenario 1: Redesigning Floorboards	$8.94	$9.26	$10.68	$7.23
Scenario 2: Floorboard Guard	$15.66	$15.53	$18.71	$12.13

E. Benefits and costs analysis

Staff compared estimated benefits and costs to assess the relation between benefits and costs of the proposed rule. Table 15 below displays metrics for both the benefits and costs of the

[68] The total number of ROVs & UTVs is slightly different due to a small difference in the market price impacts of each scenario.

proposed rule. It takes the difference and ratio of benefits and costs to assess the cost-benefit relationship.

Table 15: Net Benefits of Draft Proposed Rule Under Each Scenario

Net Benefits of Proposed Rule – ($M)	Annualized Cost -Redesigned Floorboards	Present Value - Redesigned Floorboards	Annualized Cost -Floorboard Guards	Present Value - Floorboard Guards
Benefits	$15.47	$303.13	$15.47	$303.15
Costs	$9.26	$181.49	$15.53	$304.43
Net Benefits (Benefits – Cost)	$6.21	$121.64	$-0.06	$-1.28
B/C Ratio (Benefits ÷ Cost)	1.67	1.67	1.00	1.00

Finally, Table 16 compares the benefits and costs of each compliance scenario on a per-vehicle basis to add a marginal value perspective.

Table 16: Per-Vehicle Net Benefits of Draft Proposed Rule Under Each Scenario

Net Benefits of Proposed Rule - $ per Vehicle	Average Undiscounted - Redesigned Floorboards	Annualized Costs at 3% - Redesigned Floorboards	Average Undiscounted - Floorboard Guards	Annualized Costs at 3% - Floorboard Guards
Benefits	$20.32	$12.07	$20.34	$12.08
Costs	$10.68	$7.23	$18.71	$12.13
Net Benefits (Benefits – Cost)	$9.64	$4.84	$1.63	$-0.05
B/C Ratio (Benefits ÷ Cost)	1.90	1.67	1.09	1.0

1. Uncertainty and Sensitivity Analysis

Uncertainty is inherent in any estimate or forecast of future events. This preliminary regulatory analysis estimated future benefits and costs associated with promulgating the proposed rule using the best readily available information and data. However, multiple sources of uncertainty may have an impact on the accuracy of the estimates developed for this regulatory assessment:

- A first source of uncertainty is the use of historical data to extrapolate future trends, since it is clearly not certain that the future will follow historical patterns; the farther into the future, the more uncertain is the estimate. Staff applied statistical methods to mitigate this uncertainty to the extent possible.
- A second source of uncertainty is the use of assumptions to overcome the issue of data availability. Staff carefully developed these assumptions based on subject matter expert inputs and literature review; however, they may not perfectly reflect the central trends, nor the full spectrum of possible occurrences in the real world. Staff developed a sensitivity analysis on a few key inputs to mitigate this uncertainty.
- A third source of estimate uncertainty is the omission of certain benefits and costs. For instance, CPSC did not extrapolate the number of incidents to the national level due to the number of recorded incidents of debris penetration being lower than the publication criteria established in NEISS. This may result in a significant underestimation of the benefits of the rule. Likewise, CPSC may have overlooked certain costs of implementing the proposed rule. The Commission requests comment regarding benefits and costs not addressed in this analysis.

The rest of this section describes the results of a sensitivity analysis on two assumptions used in this preliminary regulatory analysis: (1) the efficacy of the proposed rule as a percent of reduction in the number of debris penetration incidents, and (2) the time horizon of the study period. In the preliminary regulatory analysis, staff assumed the proposed rule assumed 100 percent efficacy in preventing debris penetration from compliant vehicles and used a 30-year time horizon for its study period.

Table 17 presents estimates of benefits and costs at two different levels of efficacy of the proposed rule in reducing the number of incidents. Table 17 shows that for the redesign floorboard scenario, the benefits exceed the costs, even at a 60 percent efficacy. In the case of the floorboard guard scenario, the benefits essentially match the cost at a 95 percent efficacy but are lower than the costs when the efficacy of the proposed rule is at 60 percent.

Table 17: Net Benefit Sensitivity to the Efficacy of the Proposed Rule Under Each Scenario[69]

	Redesigned Floorboards		Floorboard Guards	
Net Benefits ($M)	**95%**	**60%**	**95%**	**60%**
Benefits	$303.13	$191.64	$303.15	$191.64
Costs	($181.49)	($181.49)	($304.43)	($304.43)
Net Benefits	$121.64	$10.14	($1.28)	($112.79)
B/C Ratio	1.67	1.06	1.00	0.63

Table 18 presents estimates of benefits and costs, and sensitivity of the net benefits to the length of the study period. It compares the 30-year study period used in this regulatory assessment with a 20-year sensitivity test (2024-2043). Table 18 shows that under the redesigned floorboard scenario, the benefits exceed the cost at both lengths of time. In the case of the floorboard guard scenario, the costs exceed the benefits if the period of analysis is reduced to 20 years.

[69] The small difference in benefits between the redesigned-floorboards and floorboard-guards scenarios is the result of a small but different market price impact in each case. The floorboard-guard scenario is costlier and, therefore, produces a larger price increase that leads to a smaller number of vehicles under the proposed rule, and larger benefits with respect to the baseline situation without the rule.

Table 18: Net Benefit Sensitivity to the Period of Analysis of the Proposed Rule Under Each Scenario[70]

	Redesigned Floorboards		Floorboard Guards	
Net Benefits ($M)	**30-Year Period**	**20-Year Period**	**30-Year Period**	**20-Year Period**
Benefits	$303.13	$194.37	$303.15	$194.37
Costs	($181.49)	($139.49)	($304.43)	($221.58)
Net Benefits	$121.64	$54.88	($1.28)	($27.21)
B/C Ratio	1.67	1.39	1.00	0.88

F. Staff Evaluation of the Voluntary Standards

In developing the proposed rule, staff considered whether the Commission could rely on the current voluntary standards. The current voluntary standards for ROVs/UTVs are:

- ANSI/ROHVA 1-2016 Recreational Off-Highway Vehicles; and
- ANSI/OPEI B71.9-2016—American National Standard for Multipurpose Off-Highway Utility Vehicles.

1. ANSI/ROHVA-1

In 2016, ROHVA published the latest version of the standard -- ANSI/ROHVA-1 – 2016, *American National Standard for Recreational Off-Highway Vehicles*. The first version of the standard was published in 2010. ROHVA member companies include Can-AM/BRP, Honda, Deere and Co., Kawasaki, Mahindra, Polaris, Textron Specialized Vehicles (formerly Artic Cat) and Yamaha. Work on ANSI/ROHVA 1 started in 2008, and work completed with publication of ANSI/ROHVA 1-2010. The standard was immediately opened for revision, and a revised standard, ANSI/ROHVA 1-2011, was published in July 2011.

[70] The small difference in benefits between the redesigned-floorboards and floorboard-guards scenarios is the result of a small but different market price impact in each case. The floorboard-guard scenario is costlier, and therefore, produces a larger price increase that leads to a smaller number of vehicles under the proposed rule, and larger benefits regarding the baseline situation without the rule.

The ANSI/ROHVA-1-2016 standard defines an “ROV” as an off-highway vehicle with a minimum top speed of 30 mph, no limit on maximum speed, a maximum engine displacement of 1000 cc, and a maximum Gross Vehicle Weight Rating (GVWR) of 3,750 lbs. The standard specifies requirements for service brakes, parking brakes, and controls specifications for engine, drive train, and steering. Lighting equipment, spark arresters, and warning labels are also covered by the standard.

The ANSI/ROHVA-1-2016 standard has requirements for rollover protective structures (ROPS), lateral stability, vehicle handling, and occupant retention systems that include seat belts and passive restraints.

The ANSI/ROHVA-1-2016 standard does not have requirements for resistance to debris penetration. The vehicles defined by the ANSI/ROHVA 1- 2016 standard are included in the definition of “ROVs” in the proposed rule and subject to the requirements of the proposed rule.

2. ANSI/OPEI B71.9

In March 2012, OPEI published the ANSI/OPEI B71.9-2012, *American National Standard for Multipurpose Off-Highway Utility Vehicles*, which is a voluntary standard applicable to ROVs and UTVs. OPEI member companies include Club Car, Deere and Co., Excel Industries, Honda, Intimidator, Jacobsen, Kawasaki, Kioti, Kubota, Mahindra, MTD, Polaris, Toro, Yanmar, and Yamaha. Work on ANSI/OPEI B71.9 was started in 2008 and completed with the publication of ANSI/OPEI B71.9-2012 in March 2012.

The most recent edition of the OPEI standard was published in 2016; it provides a definition of “multipurpose off-highway utility vehicles (MOHUVs),” which is very similar to the ROHVA definition of “ROVs.” The OPEI definition of “MOHUV” requires a minimum top speed in excess of 25 mph. The OPEI definition of “MOHUV” requires a minimum cargo load of 350 lbs. and limits GVWR to 4,000 lbs. The standard specifies requirements for service brakes, parking brakes or mechanisms, and vehicle controls. Lighting equipment, spark arresters, and warning labels are also covered by the standard. MOHUVs can be ROVs (those vehicles with top speeds greater than 30 mph) or UTVs (those vehicles with top speeds of less than 30 mph).

The ANSI/OPEI B71.9-2016 standard does not have requirements to guard against the debris penetration risks. The vehicles defined by the ANSI/OPEI B71.9-2016 standard are included in the definition of “ROVs” and “UTVs” in the proposed rule and subject to the requirements of the proposed rule.

G. Alternatives to the Proposed Rule

The Commission considered four alternatives to the proposed rule: (1) conduct marketing campaigns and recalls instead of promulgating a final rule; (2) rely on voluntary standards development; (3) limit ROV and UTV speed to a maximum of 10 miles per hour, and (4) implement a small batch exemption. The Commission is not adopting these alternatives, for the following reasons:

1. Conduct Marketing Campaigns and Recalls Instead of Promulgating a Final Rule

The Commission could issue news releases or utilize other information and marketing techniques to warn consumers about debris penetration hazards associated with ROVs and UTVs instead of issuing a mandatory rule. With this alternative, most vehicles would comply with one of the two voluntary ROV standards, and ROV and UTV manufacturers would incur no costs to modify or test their vehicles to comply with the proposed rule. However, neither voluntary standard includes a performance standard requirement to prevent debris penetration into the occupant area.

Information and marketing campaigns are unlikely to reduce the number of injuries and societal costs associated with ROV/UTV debris penetration hazard. ROV/UTV users, aware of the debris penetration hazard, may modify their behavior, drive more alertly, reduce driving speed, and avoid debris, when possible. However, given that encountering debris in an off-highway environment is largely unavoidable, and that debris penetration is possible at speeds as low as 2 mph, information and marketing campaigns are unlikely to substantially reduce risk of injury.

Recalls only apply to an individual manufacturer and product, do not extend to similar products, and occur only after consumers have purchased and used such products and have been exposed to and potentially injured or killed by the hazard. Additionally, recalls can only address products that are already on the market and cannot prevent unsafe products from entering the market.

Therefore, much of the estimated $18.02 million annualized societal costs would continue to be incurred by consumers in the form of deaths and injuries. In addition, this alternative would require either additional funding from Congress out of the Federal Treasury, or reallocation of CPSC's appropriations, such that other safety-related activities that benefit the public are not undertaken. Both options entail additional costs to society. For this reason, the Commission is not adopting this alternative.

2. Rely on Voluntary Standards Development

The Commission could direct staff to work with voluntary standards development organizations to address the hazard. This alternative would allow ROHVA and OPEI member firms to determine collectively the degree, manner, and timing of debris penetration hazard mitigation, which could delay or reduce costs incurred by these firms to address the hazard.

ROHVA and OPEI member firms supplied approximately 95 percent of the ROVs and UTVs sold in the United States in 2019. Non-member firms may choose not to comply with ROHVA and OPEI voluntary standards, and therefore, incur no associated costs. However, staff has been discussing debris penetration hazards with ROHVA and OPEI since 2018, without them making progress on standard development to adequately address this hazard pattern. Staff will continue to work with ROHVA and OPEI on voluntary standards, but do not know if, or when, a standard will be developed to adequately address this hazard. Until such voluntary standards are developed, staff expects the number and societal costs of injuries and fatalities associated with debris penetration hazards to remain at or near current levels on a per-vehicle basis. Therefore, the Commission is not adopting this alternative.

3. Limiting ROV and UTV Speed to a Maximum of 10 Miles per Hour

In making their recommendation regarding this alternative, CPSC staff weighed both quantifiable factors and unquantifiable factors. If the Commission promulgated a rule limiting ROV and UTV speed to a maximum of 10 miles per hour, staff expects benefits, in the form of reduced societal costs, to be substantially less than that of the proposed rule, as testing conducted by SEA, Ltd., indicated many ROVs and UTVs are subject to debris penetration into the occupant area at speeds less than 10 mile per hour. Therefore, although staff would expect costs to manufacturers to be less, quantifiable net benefits would be less, as well. In addition, setting the maximum speed at 10 mph could have a negative impact on consumer acceptance of the requirement and result in costs, including time, inconvenience, and reduced consumer satisfaction, leading to substantial lost consumer surplus and utility of the product. Considering both the quantifiable and unquantifiable costs and benefits, staff determined that the net benefit of this alternative is less than that of the proposed rule. Therefore, the Commission is not adopting this alternative.

4. Small Batch Exemption

The Commission could exclude firms that produce or import small numbers of ROVs and/or UTVs from the proposed rule's performance requirements. In this case, most small businesses would not suffer adverse economic impacts. Small manufacturers supplied approximately 1.3 percent of ROVs and UTVs sold in the United States in 2019. Small distributers of foreign-manufactured ROVs and UTVs accounted for 2.4 percent of U.S. sales in 2019. Combined, small businesses comprised approximately 3.7 percent of the 2019 U.S. ROV and UTV market. The Commission is not aware of any fatal or nonfatal debris penetration-related injuries associated with ROVs and UTVs manufactured or imported by small firms. At the same time, however, the Commission is unaware of any engineering differences between vehicles manufactured by small manufacturers versus large ones, and there are no data to suggest that the risk of injury posed by vehicles manufactured or supplied by small businesses is any different than the risk posed by vehicles manufactured or supplied by large firms. Based on this, the Commission is not adopting a small batch exemption.

IX. Initial Regulatory Flexibility Analysis

Whenever an agency publishes an NPR, Section 603 of the Regulatory Flexibility Act (RFA), 5 USC 601–612, requires agencies to prepare an initial regulatory flexibility analysis (IRFA), unless the head of the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. The IRFA, or a summary of it, must be published in the *Federal Register* with the proposed rule. Under Section 603(b) of the RFA, each IRFA must address:

(1) a description of why action by the agency is being considered;

(2) a succinct statement of the objectives of, and legal basis for, the proposed rule;

(3) a description of and, where feasible, an estimate of the number of small entities to which the proposed rule will apply;

(4) a description of the projected reporting, recordkeeping, and other compliance requirements of the proposed rule, including an estimate of the classes of small entities which will be subject to the requirement and the type of professional skills necessary for preparation of the report or record; and

(5) an identification to the extent practicable, of all relevant Federal rules which may duplicate, overlap, or conflict with the proposed rule.

The IRFA must also describe any significant alternatives to the proposed rule that would accomplish the stated objectives and that minimize any significant economic impact on small entities.

A. Reason for Agency Action

As described above, the intent of this rulemaking is to reduce deaths and injuries resulting from the debris penetration into the occupant area of ROVs and UTVs.

B. Objectives of and Legal Basis for the Rule

The Commission proposes this rule to reduce the risk of death and injury associated with debris penetration into the occupant area of ROVs and UTVs. The rule is promulgated under the authority of the Consumer Product Safety Act (CPSA).

C. Small Entities to Which the Rule Will Apply

The proposed rule would apply to all manufacturers and importers of ROVs and UTVs. ROV and UTV manufacturers may be classified in the North American Industrial Classification

(NAICS) category 336999 (All Other Transportation Equipment Manufacturing), or possibly, 336112 (Light Truck and Utility Vehicle Manufacturing). The Small Business Administration (SBA) size standard for these NAICS classifications are 1,000 employees and 1,500 employees, respectively. Of the 35 identified ROV and UTV manufacturers, the Commission identified seven U.S. ROV and UTV manufacturers (20 percent of manufacturers) with fewer than 1,500 employees, which, therefore, meet the SBA threshold for small business.

Importers of ROVs and UTVs could be wholesale or retail distributers. ROV and UTV wholesalers may be classified in NAICS categories 423110 (Automobile and Other Motor Vehicle Merchant Wholesalers) or 441228 (Motorcycle, ATV, and All Other Motor Vehicle Dealers). The SBA size standard for NAICS classification 423110 is 250 employees. The SBA size standard for NAICS classification 441228 is $35 million. Of the 48 identified distributers/brands, of which 26 might be foreign importers, the Commission identified 19 firms (39.6 percent of distributer/brands) distributing foreign-manufactured (primarily Chinese) ROVs and UTVs in 2019, that could be considered small businesses.[71]

D. Compliance, Reporting, and Record-Keeping Requirements of Proposed Rule

The proposed rule would establish a performance requirement for ROVs and UTVs and a test procedure that suppliers would have to meet to sell in the United States.

In 2021, the Commission contracted SEA to conduct testing related to the ROV and UTV debris penetration hazard. SEA tested a small, non-representative sample of ROV and UTV models with, and without, after-market guards. None of the models met the performance requirements of the proposed rule when operating without aftermarket guards. Therefore, the Commission expects most small (and large) ROV and UTV manufacturers would incur costs

[71] Staff made these determinations using information from Dun & Bradstreet and ReferenceUSAGov.

associated with bringing their vehicles into compliance with the proposed rule, as well as costs related to testing and issuing a general certificate of conformity (GCC).

In accordance with Section 14 of the CPSA, manufacturers would have to issue a GCC for each ROV and UTV model, certifying that the model complies with the proposed rule. According to Section 14 of CPSA, GCCs must be based on a test of each product or a reasonable testing program; and GCCs must be provided to all distributors or retailers of the product. The manufacturer would have to comply with 16 CFR part 1110 concerning the content of the GCC, retention of the associated records, and any other applicable requirement.

E. Federal Rules that May Duplicate, Overlap, or Conflict with the Proposed Rule

At the time of this document's publication, no other federal rules duplicate, overlap, or conflict with the proposed rule.

F. Potential Impact on Small Entities

One purpose of the IRFA is to evaluate the impact of a regulatory action on small entities and to determine whether that impact is economically significant. Although the SBA allows considerable flexibility in determining "economically significant," CPSC typically uses 1 percent of gross revenue as the threshold for determining "economically significant." When CPSC staff cannot demonstrate that the impact is lower than 1 percent of gross revenue, staff prepares an initial regulatory flexibility analysis.[72]

1. Impact on Small Manufacturers

[72] The 1 percent of gross revenue threshold is cited as example criteria by the SBA and is commonly used by agencies in determining economic significance (see U.S. Small Business Administration, Office of Advocacy. *A Guide for Government Agencies: How to Comply with the Regulatory Flexibility Act and Implementing the President's Small Business Agenda and Executive Order 13272*. May 2012, pp 18-20. http://www.sba.gov/sites/default/files/rfaguide_0512_0.pdf).

The preliminary regulatory analysis in Section VIII of this preamble discusses costs more fully. Based on that analysis, to achieve compliance with the proposed rule's performance requirements, ROV and UTV suppliers would incur costs from redesigning, retooling, and testing. Staff estimated this cost to be $51,050 per model in the first year.[73] This figure includes $9,361 in testing costs per model. Staff estimated the additional production cost for labor and material to be $29.23 per vehicle produced in the first year. Staff does not anticipate new reporting or recordkeeping requirements from this rule.

Staff identified seven ROV and UTV manufacturers that meet SBA size standards for small businesses. Staff applied both the per-model and per-vehicle costs to each manufacturer's number of models and unit sales in 2019. Staff found the initial cost to comply with the proposed rule exceeds 1 percent of reported annual revenue for five of the seven manufacturers identified as small businesses. For these five ROV and UTV manufacturers, the economic impact of the proposed rule is expected to be significant.

2. Impact on Small Importers

Staff identified 14 possible importers of ROVs and UTVs from foreign suppliers that would be considered small businesses based on SBA size standards. Staff identified an additional five importers for which a size determination could not be made, but that are likely small based on the number of models and units sold. A small importer would be impacted adversely by the proposed rule if its foreign supplier withdrew from the U.S. market, rather than incur the cost of compliance. Importers would also be impacted adversely if a foreign manufacturer failed to provide a GCC and had to perform its own testing for compliance. If sales of ROVs and UTVs are a substantial source of the importer's business, and the importer cannot

[73] Testing may be performed by the manufacturer by third party engineering consulting or testing firms.

find an alternative supplier of ROVs and UTVs, the economic impact on these firms might be significant. However, the U.S. ROV and UTV market has grown at an annual rate of 13.5 percent since 1998; accordingly, it is unlikely that foreign manufacturers would exit such a fast-growing market. ROV and UTV importers also import other products, such as scooters, motorcycles, and other powersport equipment. For these firms, any decline in ROV and UTV sales and revenue may be partially or fully offset by increasing sales and revenues derived from these other products.

Small importers would be responsible for issuing a GCC certifying that their ROVs and UTVs comply with the rule's requirements. However, importers may issue GCCs based upon certifications provided by or testing performed by their suppliers. The impact on small importers whose suppliers provide GCCs should not be significant. If a small importer's supplier does not provide the GCC or testing reports, then the importer would have to certify each model for conformity based on a reasonable testing program. Importers would likely contract with an engineering consulting or testing firm to conduct the certification tests. As discussed in the regulatory analysis, staff estimated certification testing to be $9,361 per model. This would exceed 1 percent of the revenue for 13 of the estimated 19 identified small importers, assuming these firms continue to import the same mix of products as in the pre-regulatory environment.

G. Alternatives for Reducing the Adverse Impact on Small Businesses

The Commission considered several alternatives to the proposed rule. These include: (1) conducting marketing campaigns and recalls instead of promulgating a final rule; (2) relying on voluntary standards development; (3) limiting ROV and UTV speed to a maximum of 10 miles per hour, and (4) implementing a small batch exemption. The Commission is not adopting these alternatives for the reasons stated above.

H. Conclusion

The Commission identified seven manufacturers that meet the SBA criteria to considered small firms. For five of these firms, the estimated cost from the proposed rule exceeds 1 per percent of annual revenue. The Commission assesses that the proposed rule could have a significant economic impact on these five firms.

The Commission estimated that there are 19 importers of foreign manufactured ROVs and UTVs that meet the SBA criteria to be considered small. A small importer whose supplier exits the market, or does not provide the importer a GCC, could experience a significant adverse economic impact. However, given the fast-growing market, the Commission does not anticipate foreign manufacturers will exit the U.S. market, and further, the Commission assumes that foreign manufacturers would provide certifications that small importers could rely on, so that these foreign manufacturers could preserve their sales. Given that assumption, the Commission assesses no significant economic impact on the importers of ROVs and UTVs.

In summary, the proposed rule could have a significant adverse economic impact on five of the seven identified small manufacturers, but it is unlikely to have a significant direct impact on the 19 small importers of ROVs and UTVs.

The Commission welcomes public comments on this IRFA. Small businesses that believe they would be affected by the proposed rule are encouraged to submit comments. The comments should be specific and describe the potential impact, magnitude, and alternatives that could reduce the impact of the proposed rule on small businesses.

X. Environmental Considerations

Generally, the Commission's regulations are considered to have little or no potential for affecting the human environment, and environmental assessments and impact statements are not usually required. See 16 CFR 1021.5(a). The proposed rule is not expected to have an adverse impact on the environment and is considered to fall within the "categorical exclusion" for the purposes of the National Environmental Policy Act. 16 CFR 1021.5(c).

XI. Preemption

Executive Order (EO) 12988, Civil Justice Reform (Feb. 5, 1996), directs agencies to specify the preemptive effect of a rule in the regulation. 61 FR 4729 (Feb. 7, 1996). The proposed regulation for ROVs and UTVs is issued under authority of the CPSA. 15 U.S.C. 2051-2089. Section 26 of the CPSA provides that "whenever a consumer product safety standard under this Act is in effect and applies to a risk of injury associated with a consumer product, no State or political subdivision of a State shall have any authority either to establish or to continue in effect any provision of a safety standard or regulation which prescribes any requirements as to the performance, composition, contents, design, finish, construction, packaging or labeling of such product which are designed to deal with the same risk of injury associated with such consumer product, unless such requirements are identical to the requirements of the Federal Standard." 15 U.S.C. 2075(a).

States or political subdivisions of a state may apply for an exemption from preemption regarding a consumer product safety standard, and the Commission may issue a rule granting the exemption if it finds that the state or local standard: (1) provides a significantly higher degree of protection from the risk of injury or illness than the CPSA standard, and (2) does not unduly burden interstate commerce. Id. 2075(c).

Thus, the proposed rule for ROVs and UTVs, if finalized, would preempt non-identical state or local requirements for ROVs and UTVs designed to protect against the same risk of injury, *i.e.*, debris penetration, from ROVs and UTVs.

XII. Certification

Section 14(a) of the CPSA requires that products subject to a consumer product safety rule under the CPSA, or to a similar rule, ban, standard or regulation under any other act enforced by the Commission, must be certified as complying with all applicable CPSC-enforced requirements. 15 U.S.C. 2063(a). A final rule on ROV and UTV debris penetration would subject ROVs and UTVs to this requirement.

XIII. Effective Date

The Administrative Procedure Act (APA) generally requires that the effective date of a rule be at least 30 days after publication of a final rule. 5 U.S.C. 553(d). Section 9(g)(1) of the CPSA states that a consumer product safety rule shall specify the date such rule is to take effect, and that the effective date must be at least 30 days after promulgation but cannot exceed 180 days from the date a rule is promulgated, unless the Commission finds, for good cause shown, that a later effective date is in the public interest and publishes its reasons for such finding.

If finalized, the Commission proposes an effective date of 180 days after publication of the final rule. The Commission concludes that ROV/UTV models that do not comply with the resistance to debris penetration requirements can be modified, with design changes to the floorboards and/or augmentation of floorboard guards, in less than 4 person-months (at the most) and concludes that these ROV/UTV models can be tested for compliance in 1 day. Therefore, the Commission concludes that 180 days is a reasonable period for manufacturers to modify vehicles, if necessary; conduct required tests; and analyze test results to ensure compliance with the recommended resistance to debris penetration requirements.

XIV. Proposed Findings

The CPSA requires the Commission to make certain findings when issuing a consumer product safety standard. 15 U.S.C. 2058(f). This section discusses preliminary support for those findings.

A. Degree and Nature of the Risk of Injury

The risk of injury involves debris penetration through the floorboards of ROVs and UTVs. Debris, usually a tree branch, can puncture through the floorboard and enter the occupant area of the vehicle, posing a risk of laceration or impalement to the driver and/or passengers, which can cause severe injury or death.

Between 2009 and 2021, there were a total of 107 incidents found in CPSC databases involving debris penetration associated with ROVs and UTVs. There were 6 reported fatalities and 22 reported injuries related to the known debris penetration incidents. Additionally, there were approximately 630 reports of debris cracking and/or breaking through floorboards and 10 injuries associated with 3 ROV debris penetration recalls.

B. Number of Consumer Products Subject to the Rule

Except for the year 2009, the annual sales of ROVs and UTVs to the United States have increased steadily from an estimated 35,041 units in 1998 to 429,135 units in 2019. In 2019, there were an estimated 2.34 million ROVs and UTVs in use in the United States.

C. Need of the Public for the Products and Probable Effect of Utility, Cost, and Availability of the Product

The effect of the rule will be limited to redesigning the floorboards of the vehicles; thus, the rule is unlikely to have an effect on the utility of ROVs and UTVs.

The effect of the rule on cost and availability of ROVs and UTVs is expected to be minimal. In 2019, the average manufacturer's suggested retail prices (MSRP) of ROVs and UTVs ranged from about $4,599 to $53,700. When weighted by sales volume, the mean MSRP is $13,182 for ROVs and UTVs, which equates to $14,302 in 2021 dollars. The preliminary regulatory analysis estimates a per-unit cost to ROVs and UTVs of the rule to be $10.68 (undiscounted per unit costs of redesigning floorboard for ROVs and UTVs) to $18.71 (undiscounted per unit cost of floorboard guard fix for ROVs and UTVs.) Because this per-unit cost resulting from the rule is a very small percentage of the overall retail price of a ROV or UTV, the rule would have only a minimal effect on the cost or availability of ROVs or UTVs.

D. Other Means to Achieve the Objective of the Proposed Rule, While Minimizing Adverse Effects on Competition and Manufacturing

The proposed requirement of the rule achieves the objective of reducing debris penetration hazards associated with ROVs and UTVs while minimizing the effect on competition and manufacturing. Because the proposed rule implements a performance requirement, manufacturers may choose how best to comply with it. This facilitates, through innovation and competition, the rollout of consumer-driven, cost-effective designs, and helps minimize potential adverse effects on consumer choice, and on manufacturing and commercial practices. Manufacturers may develop ways to comply with the performance requirement that are either less costly than what the preliminary regulatory analysis estimated, or bring more value to the consumer, or both.

In addition, as described in Section XIV.C of this preamble, the per-unit cost resulting from the rule is a very small percentage of the overall retail price of an ROV or UTV. With such a relatively low impact, it is unlikely that ROV or UTV companies would withdraw from the market or that the number of ROV or UTV models will be affected. The Commission preliminarily finds that the proposed rule minimizes impact on competition, marketing, and commercial practices.

E. Unreasonable Risk

The Commission is aware of 107 debris penetration incidents from its NEISS and CPSRMS databases. There were 6 fatalities, 3 of which involved debris penetration into the chest. There were 22 injuries caused by floorboard debris penetration, some of the injuries sustained were severe.

There were 3 Commission recalls of ROVs due to debris penetration hazards, which collectively involved approximately 55,000 vehicles. There were approximately 630 manufacturer-reported incidents of debris cracking or breaking through floorboards and 10 injuries associated with these recalls.

ROVs have maximum speed capabilities greater than 30 mph, and UTVs have maximum speed capabilities between 25 and 30 mph. These vehicles are intended to be driven off-road, including wooded areas or trails, where tree branches and sticks are commonplace. CPSC incident data shows that debris penetration is occurring at speeds less than 10 mph. CPSC testing shows that debris penetration can occur at speeds as low as 2.5 mph on standard OEM ROV and UTV floorboards. In addition, these incidents often occur rapidly and without notice, so that there is little time for the user to react.

Given the potentially severe and unexpected nature of this hazard when using the vehicle as intended, the Commission preliminarily finds that this rule is necessary to prevent an unreasonable risk of injury.

F. Public Interest

The proposed rule is intended to address an unreasonable risk of injury from debris penetration into ROVs and UTVs. As explained in this preamble, adherence to the requirements of the proposed rule would reduce deaths and injuries from ROV and UTV debris penetration incidents in the future; thus, the rule is in the public interest.

G. Voluntary Standards

There are two voluntary standards for ROVs and UTVs:

- ANSI/ROHVA 1-2016 Recreational Off-Highway Vehicles;
- ANSI/OPEI B71.9-2016—American National Standard for Multipurpose Off-Highway Utility Vehicles.

Neither standard has requirements to address debris penetration. For this reason, the Commission preliminarily concludes that the voluntary standards will not adequately address the unreasonable risk of injury associated with debris penetration in ROVs and UTVs.

H. Relationship of Benefits to Costs

The benefits expected from the proposed rule bear a reasonable relationship to its cost. The proposed rule is intended to reduce the impalement and laceration risks of a tree branch penetrating the ROV/UTV floor, and thereby, reduce the societal costs of the resulting injuries and deaths. This reduction in societal costs amounts to $15.47 million per year in projected benefits. The quantifiable benefits of the proposed rule are estimated at $12.08 per ROV/UTV. The costs associated with the proposed requirements to prevent debris penetration are expected to be between $9.26 and $15.53 million per year. On a per-unit basis, the Commission estimates the total costs of the proposed rule to be between $7.23 to $12.13 per ROV/UTV in current dollars.

I. Least-Burdensome Requirement that Would Adequately Reduce the Risk of Injury

As described in Section IX.G of this preamble, the Commission considered less burdensome alternatives to the proposed rule addressing debris penetration in ROVs and UTVs and concluded preliminarily that none of these alternatives would adequately reduce the risk of injury.

XV. Promulgation of a Final Rule

Section 9(d)(1) of the CPSA requires the Commission to promulgate a final consumer product safety rule within 60 days of publishing a proposed rule. 15 U.S.C. 2058(d)(1). Otherwise, the Commission must withdraw the proposed rule if it determines that the rule is not reasonably necessary to eliminate or reduce an unreasonable risk of injury associated with the product or is not in the public interest. Id. However, the Commission can extend the 60-day period, for good cause shown, if it publishes the reasons for doing so in the *Federal Register*. Id.

The Commission finds that there is good cause to extend the 60-day period for this rulemaking. Under both the Administrative Procedure Act and the CPSA, the Commission must provide an opportunity for interested parties to submit written comments on a proposed rule. 5 U.S.C. 553; 15 U.S.C. 2058(d)(2). The Commission is providing 60 days for interested parties to submit written comments. A shorter comment period may limit the quality and utility of information CPSC receives in comments, particularly for areas where it seeks data and other detailed information that may take time for commenters to compile. Additionally, the CPSA requires the Commission to provide interested parties with an opportunity to make oral presentations of data, views, or arguments. 15 U.S.C. 2058. This requires time for the Commission to arrange a public meeting for this purpose, and provide notice to interested parties in advance of that meeting. After receiving written and oral comments, CPSC staff must have time to review and evaluate those comments.

These factors make it impractical for the Commission to issue a final rule within 60 days of this proposed rule. Moreover, issuing a final rule within 60 days of the NPR may limit commenters' ability to provide useful input on the rule, and CPSC's ability to evaluate and take that information into consideration in developing a final rule. Accordingly, the Commission finds that there is good cause to extend the 60-day period for promulgating the final rule after publication of the proposed rule.

XVI. Request for Comments

We invite all interested persons to submit comments on any aspect of the proposed rule. Specifically, the Commission seeks comments on the following:

- Information regarding any analysis and/or tests done on penetration of the occupant area of ROVs/UTVs;
- Information regarding any analysis on the shape, composition, material properties, etc., of objects that have penetrated occupant area of ROVs/UTVs;
- Information on the speed of the vehicle and the energy associated with penetration of the occupant area of ROVs/UTVs;
- The preliminary regulatory analysis assumes manufacturers would choose between two compliance options "redesigned floorboards" or "floorboard guards;" but in practice, manufacturers may choose either of these two solutions or may choose a different solution that proves more cost-effective. We request information on the plausibility and likelihood of the options considered, and other solutions not included in the preliminary regulatory analysis.
- Information regarding any potential costs or benefits that were not included the preliminary regulatory analysis;

- Detailed information regarding cost estimates for either of the compliance options in the proposed rule.
- Information regarding the number of small businesses impacted by the proposed rule and the magnitude of the impacts of the proposed rule.
- Comments on the definitions in § 1421.2 of the proposed rule.
- Comments on the testing procedures and protocol of the proposed rule, and potential alternatives.
- Comments regarding the appropriateness of the 180-month effective date, or other periods commenters may alternatively recommend.

XVII. Notice of Opportunity for Oral Presentation

Section 9 of the CPSA requires the Commission to provide interested parties "an opportunity for oral presentation of data, views, or arguments." 15 U.S.C. 2058(d)(2). The Commission must keep a transcript of such oral presentations. *Id.* Any person interested in making an oral presentation must contact the Commission, as described under the **DATES** and **ADDRESSES** section of this notice.

List of Subjects

16 CFR Part 1421

Consumer protection, Imports, Administrative practice and procedure, Recreation and Recreation areas, Safety.

For the reasons discussed in the preamble, the Commission proposes to amend Title 16 of the Code of Federal Regulations as follows:

1. Add part 1421 to read as follows:

PART 1421 – SAFETY STANDARD FOR ROV AND UTV DEBRIS PENETRATION HAZARDS

Sec.

1421.1 Scope, purpose and effective date.

1421.2 Definitions.

1421.3 Requirement.

1421.4 Test procedures.

1421.5 Prohibited stockpiling.

1421.6 Findings.

Authority: 15 U.S.C. 2056, 15 U.S.C. 2058, and 5 U.S.C. 553.

§ 1421.1 Scope, purpose and effective date.

(a) This part 1421, a consumer product safety standard, establishes requirements for recreational off-highway vehicles (ROVs) and utility terrain or utility task vehicles (UTVs), as defined in § 1421.2, to address debris penetration hazards.

(b) Any ROV or UTV manufactured or imported after [date that is 180 days after publication of a final rule] shall comply with the requirements stated in § 1421.3.

§ 1421.2 Definitions.

In addition to the definitions in section 3 of the Consumer Product Safety Act (15 U.S.C. 2051), the following definitions apply for purposes of this part 1421.

(a) **Recreational off-highway vehicle (ROV)** means a motorized vehicle designed or intended for off-highway use with the following features: four or more wheels with tires designed for off-highway use, non-straddle-seating for one or more occupants, a steering wheel for steering controls, foot controls for throttle and braking, and a maximum vehicle speed greater than 30 miles per hour (mph).

(b) **Utility terrain or utility task vehicle (UTV)** means a motorized vehicle designed or intended for off-highway use with the following features: four or more wheels with tires designed for off-highway use, non-straddle seating for one or more occupants, a steering wheel for steering controls, foot controls for throttle and braking, and a maximum vehicle speed typically between 25 and 30 mph.

§ 1421.3 Requirements.

Upon testing to the test procedure described in § 1421.4, the test ROV/UTV floorboard and/or floorboard guard shall not allow any breach of the test dowel into the occupant area, although deformations and/or deflections of the floorboard and/or floorboard guard are allowable. Examples of breach include cracks, holes, tears, seam gaps, or any other openings that allow any part of the test dowel to enter the occupant area.

§ 1421.4 Test procedures.

(a) **Load Condition.**

1) **Weight.** The required load condition for a two-seat model is 430 lbs, representing a driver and a front seat passenger, each equivalent to a 95th percentile male (215 lbs).

For four-seat models, the load condition shall be 860 lbs, representing the driver and three passengers. For six-seat models, the load condition shall be 1290 lbs, representing the driver and five passengers.

Note 1 to paragraph (a)(1). Typical gross vehicle weights of fully loaded test vehicles or simulated vehicle sleds exceed 2000 lbs.

2) **[Reserved].**

(b) **Test Vehicle or Simulated Vehicle Sled Conditions.**

1) The fully loaded test vehicle shall be fitted with the test floorboard and/or floorboard guard(s), as offered for sale.

2) If a simulated vehicle sled will be used, where a ROV/UTV front metal frame is fitted with the test floorboard and/or floorboard guard(s), the simulated vehicle sled must be able to translate on a linear track that can propel the simulated vehicle sled to at least 10 mph.

(c) **Test Speed.**

1) Test Vehicle or simulated vehicle sled speed, in miles per hour (mph) shall be measured at the moment of impact.

2) The vehicle speed or simulated vehicle sled speed at the moment of impact shall be at least 10 mph.

(d) **Test Location.** The test dowel shall be positioned in such a way that the test dowel will strike the wheel-well area. The target of the test dowel cannot be any component other than the floorboard or floorboard guard surface. The target shall be at the point on the floorboard or floorboard guard most likely to produce the most adverse results, such as a seam, crease, catch point, or bend.

(e) **Test Equipment.** **(1)** A 2-inch diameter oak dowel positioned at angle between 12° to 25° from horizontal (indicated as X° in Figure 1) shall be installed on a dowel holder that can pivot about its transverse axis. The length of the dowel shall be between 39 inches to 65 inches.

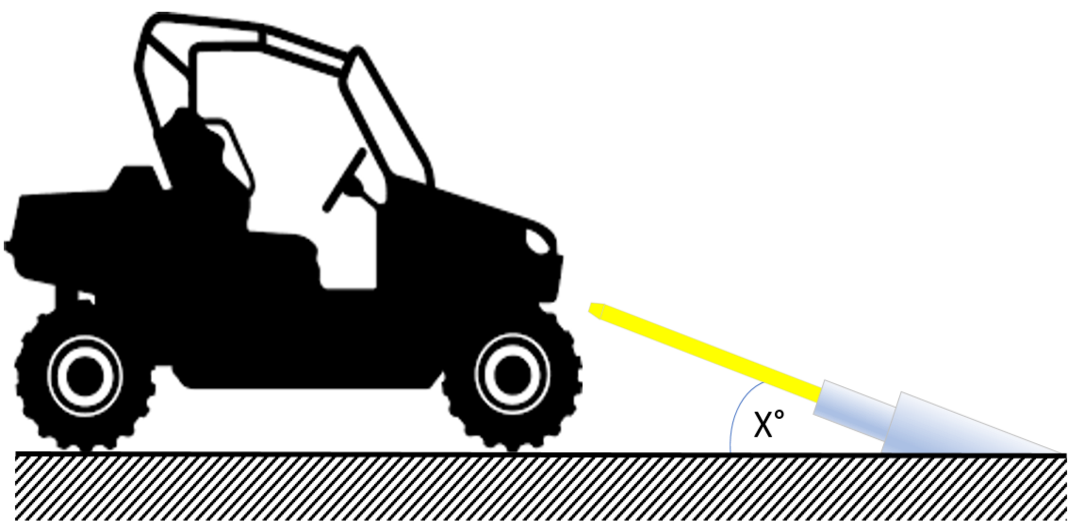


Figure 1 – Illustration of Debris Penetrator Test Dowel Orientation

(2) The tip of dowel shall be tapered, such that the tip surface diameter is 1 inch, and the tip cone length is 1 inch. See Figure 2.

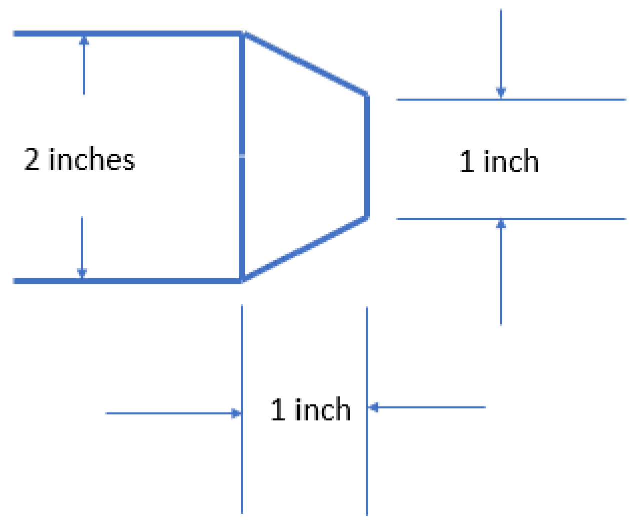


Figure 2 – Illustration of Debris Penetrator Test Dowel Tip Taper

(3) The dowel holder shall be constructed of a rigid material, such that the dowel holder does not fracture during the impact test.

Note to section (e)(3). To minimize damage to test equipment, a vehicle or simulated vehicle sled braking system and/or energy absorption foam blocks located 2 feet past the debris penetrator dowel holder is recommended.

(4) The braking system shall only activate after the vehicle or simulated vehicle sled collides completely with the debris penetrator dowel.

(f) **Test Conditions**. If a test vehicle is used, the test surface must be dry asphalt or dry concrete that is free of contaminants. Sufficient track length shall be available to allow the test vehicle or simulated vehicle sled to reach 10 mph. The test surface must be flat and have a grade slope of 1.7% (1°) or less. Ambient temperature shall be greater than 0°C (32°F).

(g) **Test Procedure**. The debris penetrator test dowel shall be aligned with the target site of the floorboard or floorboard guard. A fully loaded, fully instrumented test vehicle or simulated vehicle sled shall be propelled in a straight-line path to collide with the debris penetrator test dowel, where the test vehicle or simulated vehicle sled speed shall be at least 10 mph at the moment of impact. For each vehicle model, a minimum of two test trials of one chosen test method shall be conducted.

Note 2 to paragraph (g): Rationale for Test Conditions. The required ambient temperature of 0°C (32°F) or greater, maximum allowable flat course slope grade of 1.7% (1°) or less, flat dry asphalt or dry concrete conditions, and the 95th percentile male weight are consistent with the lateral stability requirements of ANSI/OPEI B71.9-2016 and ANSI/ROHVA-1-2016. They simulate real use and allow for repeatable test results.

§ 1421.5 Prohibited stockpiling.

(a) Base period. The base period for ROVs and UTVs is any period of 365 consecutive days, chosen by the manufacturer or importer, in the 5-year period immediately preceding the promulgation of the final rule.

(b) Prohibited acts. Manufacturers and importers of ROVs and UTVs shall not manufacture or import ROVs or UTVs that do not comply with the requirements of this part between [date of promulgation of the rule] and [effective date of the rule] at a rate that is greater than 120 percent of the rate at which they manufactured or imported ROVs and UTVs during the base period.

§ 1421.6 Findings.

(a) General. To issue a consumer product safety standard under the Consumer Product Safety Act, the Commission must make certain findings and include them in the rule. 15 U.S.C. 2058(f)(3). These findings are presented in this section.

(b) Degree and nature of the risk of injury. (1) The risk of injury involves debris penetration through the floorboards of ROVs and UTVs. Debris, usually a fallen tree branch, can puncture through the floorboard and enter the occupant area of the vehicle, posing a risk of laceration or impalement to the driver and/or passengers, creating a risk of severe injury or death.

(2) Between 2009 and 2021, there were a total of 107 incidents found in CPSC databases involving debris penetration associated with ROVs and UTVs. There were six reported fatalities and 22 reported injuries related to the known debris penetration incidents. Additionally, there were approximately 630 manufacturer reports of debris cracking or breaking through floorboards and 10 injuries associated with three ROV debris penetration recalls.

(c) Number of consumer products subject to the rule. Except for the year 2009, the annual sales of ROVs and UTVs to the United States have increased steadily from an estimated 35,041 units in 1998 to 429,135 units in 2019. In 2019, there were an estimated 2.34 million ROVs and UTVs in use in the United States.

(d) The need of the public for the product and the effects of the rule on the utility, cost and availability. The effect of the rule will be limited to redesigning the floorboards of the vehicles, so it is unlikely to have an effect on the utility of ROVs and UTVs.

The effect of the rule on cost and availability of ROVs and UTVs is expected to be minimal. In 2019, the average manufacturer's suggested retail prices (MSRP) of ROVs and UTVs ranged from about $4,599 to $53,700. When weighted by sales volume, the mean MSRP is $13,182 for ROVs and UTVs, which equates to $14,302 in 2021 dollars. The preliminary regulatory analysis estimates a per-unit cost to ROVs and UTVs of the rule to be $10.68 (undiscounted per unit costs of redesigning floorboard for ROVs and UTVs) to $18.71 (undiscounted per unit cost of floorboard guard fix for ROVs and UTVs.) Because this per-unit cost resulting from the rule is a very small percentage of the overall retail price of a ROV or UTV, the rule would have only a minimal effect on the cost or availability of ROVs or UTVs.

(e) **Other means to achieve the objective of the rule, while minimizing the impact on competition and manufacturing.** The rule achieves the objective of reducing debris penetration hazards associated with ROVs and UTVs while minimizing the effect on competition and manufacturing. Because the proposed rule implements a performance requirement, manufacturers may choose how best to comply with it. This facilitates innovation, competition, consumer choice, and the possibility of cost-effective options, and helps minimize adverse effects on competition, manufacturing, and commercial practices.

In addition, as described in subsection (d), the per-unit cost resulting from the rule is a very small percentage of the overall retail price of an ROV or UTV. With such a relatively low impact, it is unlikely that ROV or UTV companies would withdraw from the market or that the number of ROV or UTV models will be affected. The Commission preliminarily finds that the proposed rule minimizes impact on competition, marketing, and commercial practices.

(f) Unreasonable risk. Debris penetration involves debris (usually a tree branch or stick) penetrating an ROV or UTV, usually the floorboard of the underside of an ROV or UTV. When such penetration occurs, the branch or debris can penetrate far enough into the vehicle to strike the occupant or passengers. The Commission is aware of 107 debris penetration incidents from its NEISS and CPSRMS databases. There were six fatalities, three of which involved debris penetration into the chest. There were 22 injuries caused by floorboard debris penetration, some of them severe.

There were three Commission recalls of ROVs due to debris penetration hazards, which collectively involved approximately 55,000 vehicles. There were approximately 630 manufacturer-reported incidents involving debris cracking or breaking through the floorboards and 10 injuries associated with these recalls.

ROVs have maximum speed capabilities greater than 30 mph, and UTVs typically have maximum speed capabilities between 25 and 30 mph. These vehicles are intended to be driven off-road, including wooded areas or trails, where tree branches and sticks are commonplace. CPSC incident data shows that debris penetration is occurring at speeds less than 10 mph. CPSC testing shows that debris penetration can occur at speeds as low as 2.5 mph on standard OEM ROV and UTV floorboards. In addition, these incidents often occur rapidly and without notice, so that there is little time for the user to react. Voluntary standards for ROVs and UTVs do not contain requirements intended to address floorboard debris penetration in the vehicles.

Given the potentially severe and unexpected nature of this hazard when using the vehicle as intended, the Commission finds that this rule is reasonably necessary to eliminate or reduce an unreasonable risk of injury.

(g) Public interest. The proposed rule is intended to address an unreasonable risk of injury from debris penetration into ROVs and UTVs. Adherence to the requirements of the proposed rule would reduce deaths and injuries from ROV and UTV debris penetration incidents in the future; thus, the rule is in the public interest.

(h) Voluntary standards. There are two voluntary standards for ROVs and UTVs: ANSI/ROHVA 1-2016, American National Standard for Recreational Off-Highway Vehicles, and ANSI/OPEI B71.9-2016, American National Standard for Multipurpose Off-Highway Utility Vehicles. Neither standard has requirements to address debris penetration. For this reason, the Commission concludes that the voluntary standards will not adequately address the unreasonable risk of injury associated with debris penetration in ROVs and UTVs.

(i) Relationship of benefits to costs. This rule is intended to reduce the impalement and laceration risks of a tree branch penetrating the ROV/UTV floor, and therefore, provide projected benefits of $15.47 million per year by reducing the societal costs of debris penetration injuries and deaths. The costs associated with the proposed requirements to prevent debris penetration are expected to be between $9.26 and $15.53 million per year. The Commission finds that the benefits expected from the rule bear a reasonable relationship to its costs.

(j) Least burdensome requirement that would adequately reduce the risk of injury. The Commission considered several alternatives to the proposed rule. However, the Commission finds that these alternatives would not adequately address the unreasonable risk of injury associated with debris penetration in ROVs and UTVs.

(1) Conduct Marketing Campaigns Instead of Promulgating a Final Rule. The Commission considered conducting marketing campaigns and recalls instead of promulgating a rule to address the debris penetration hazard associated with ROVs and UTVs. However, even though an information and marketing campaign may make ROV and UTV users more aware of the debris penetration hazard, a simple modification of consumer behavior would be unlikely to address the risk of injury. Encountering debris in an off-highway environment, where these vehicles are intended to be driven, is largely unavoidable, and debris penetration is possible at speeds as low as 2 mph.

(2) Recalls. The Commission considered recalls to address the risk of debris penetration associated with ROVs and UTVs. Recalls, however, only apply to an individual manufacturer and product, do not extend to similar products, and occur only after consumers have purchased and used such products and have been exposed to and potentially injured or killed by the hazard. Additionally, recalls can only address products that are already on the market and cannot prevent unsafe products from entering the market.

With either a marketing campaign or use of recalls, much of the estimated $18.02 million annualized societal costs would continue to be incurred by consumers in the form of deaths and injuries. Therefore, the Commission concludes that marketing campaigns and recalls, without a mandatory rule, are unlikely to reduce the risk of injury associated with debris penetration.

(4) Rely on Voluntary Standards Development. The Commission considered directing staff to work with voluntary standards development organizations to address the hazard. However, staff has been discussing debris penetration hazards with ROHVA and OPEI since 2018, and there has been inadequate progress on standard development to address the risk. Although staff will continue to work with ROHVA and OPEI on the voluntary standards, it is not clear if or when a standard will be developed to adequately address the risk of injury. Until a voluntary standard is developed, the number and societal costs of injuries and fatalities associated with debris penetration are likely to remain at or near current levels. Therefore, the Commission concludes that rulemaking is necessary.

(5) Limit ROV and UTV Speeds to Maximum of 10 Miles per Hour. The Commission considered limiting the maximum speed of ROVs and UTVs to 10 miles per hour. Although costs to manufacturers would be expected to be less under this approach, the quantifiable net benefits would be less as well. In addition, setting the maximum speed at 10 mph could have an adverse impact on the utility of the vehicles and on consumer acceptance of the requirement. Therefore, the Commission is not adopting this approach.

Dated: ____________________________

____
Alberta E. Mills, Secretary
Consumer Product Safety Commission.

Staff Briefing Package

Notice of Proposed Rulemaking (NPR) For
Recreational Off-Highway Vehicle (ROV)
and Utility Task/Terrain Vehicle (UTV)
Debris Penetration Hazards

May 2022

For Further Information Contact:

Han Lim
Project Manager
Directorate for Engineering Sciences
301-987-2327

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EXECUTIVE SUMMARY

Recreational off-highway vehicles (ROVs) and Utility Task/Terrain Vehicles (UTVs) are motorized vehicles that have four or more tires, non-straddle seating, rollover protective structures (ROPS), and automotive-type controls for steering, throttle, and braking and are designed for use in off-highway environments. ROVs have maximum vehicle speeds greater than 30 miles per hour (mph), whereas UTVs generally have maximum speeds between 25 and 30 mph.

As of January 2022, CPSC staff is aware of 107 reported ROV/UTV-related incidents involving debris penetration that occurred between January 1, 2009 and December 31, 2021. Debris, usually a tree branch, can puncture the floorboard and enter the occupant area of the vehicle, posing a risk of laceration or impalement to the driver and/or passengers. There were six reported fatalities and 22 reported injuries related to the known debris penetration incidents. Additionally, there were approximately 630 incidents and 10 injuries associated with three ROV debris penetration hazard recalls. CPSC staff concludes that improving the material strength and debris/branch deflecting properties of the ROV/UTV floorboards can reduce the risks of impalements and lacerations.

CPSC contracted with SEA, Limited (SEA), to conduct two types of debris penetration testing: full-scale remotely operated ROV and simulated ROV sled method. These two test methods were used to study the material strength properties of ROV floorboards and to evaluate their effectiveness against debris penetration. Based on the testing, data analysis, and technical feasibility, CPSC staff recommends a minimum performance requirement that prevents debris penetration into the occupant area of a fully loaded ROV/UTV or simulated vehicle sled traveling at 10 mph that collides with a stationary 2-inch diameter oak dowel. The purpose of this performance requirement would be to reduce the likelihood of injuries and/or deaths.

The costs associated with the proposed requirements to prevent debris penetration are expected to be between $9.26 and $15.53 million per year.[1] These requirements are intended to reduce the impalement and laceration risks of a tree branch penetrating the ROV/UTV floor, and therefore, reduce the societal costs of the resulting injuries and deaths, which amount to $15.47 million per year in projected benefits. On a per-unit basis, staff estimates the total costs of the proposed rule to be between $7.23 to $12.13 per ROV/UTV in current dollars, while the quantifiable benefits of the proposed rule are estimated at $12.08 per ROV/UTV. This results in net quantifiable benefits of $-0.05 to $4.84 per ROV/UTV, or approximately $1.00 to $1.67 in benefits for every $1 in cost.

The voluntary standards for ROVs are ANSI/ROHVA 1-2016, American National Standard for Recreational Off-Highway Vehicles and ANSI/OPEI B71.9-2016, American National Standard

[1] The cost and benefit amounts discussed in this paragraph are based on the present value of future costs and benefits discounted to the present at a 3 percent discount rate. Amounts per year are annual equivalents, also estimated using a 3 percent rate. Costs and benefits are presented in 2021 dollars. Some estimates may not exactly add up, due to rounding.

for Multipurpose Off- Highway Utility Vehicles. The scope of ANSI/OPEI B71.9 includes UTVs (vehicles with maximum speeds between 25 and 30 mph). CPSC staff participated in the original development of these standards in 2009, and in beginning in 2018, CPSC staff communicated concerns regarding debris penetration hazards to the Recreational Off-Highway Vehicle Association (ROHVA) and Outdoor Power Equipment Institute (OPEI). During the September 19, 2018 voluntary standards meeting, CPSC staff expressed concerns regarding an ROV debris penetration recall associated with 628 debris penetration incidents and eight injuries. CPSC staff recommended forming task groups to study the ROV debris penetration issue. CPSC staff discussed debris penetration hazard recalls and redacted debris penetration hazard in-depth investigation (IDI) reports with ROHVA and OPEI from 2018 to 2021. However, to date, neither standard includes performance requirements that address debris penetration hazards. Therefore, staff assess that the voluntary standards do not adequately reduce the risk of debris penetration hazards in ROVs and UTVs.

CPSC staff's research and analysis demonstrate that CPSC staff's recommended requirements will reduce ROV deaths and injuries by reducing the occurrence of ROV/UTV debris penetrations. CPSC staff concludes that the recommended requirements are technologically feasible and that the potential benefits of the draft proposed rule meet or exceed the rule's costs. Moreover, the current voluntary standards for ROVs do not have requirements to reduce deaths and injuries associated with ROV/UTV debris penetration. For these reasons, CPSC staff recommends that the Commission publish the draft notice of proposed rulemaking (NPR) for ROVs and UTVs submitted with this briefing package.

BRIEFING MEMORANDUM

United States
Consumer Product Safety Commission

Memorandum

TO: The Commission
Alberta E. Mills, Secretary

DATE: May 18, 2022

THROUGH: Austin C. Schlick, General Counsel
Mary T. Boyle, Executive Director
DeWane Ray, Deputy Executive Director

FROM: Duane Boniface, Assistant Executive Director
Office of Hazard Identification and Reduction

Han Lim, Project Manager
Directorate for Engineering Sciences

SUBJECT: Proposed Rule for Recreational Off-Highway Vehicle (ROV) and Utility Task/Terrain Vehicle (UTV) Debris Penetration Hazards

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I. INTRODUCTION

Recreational Off-Highway Vehicles (ROVs) and Utility Task/Terrain Vehicles (UTVs) are motorized vehicles that combine off-highway capability with utility and recreational use. Reports of ROV/UTV-related fatalities and injuries prompted the U.S. Consumer Product Safety Commission (CPSC, Commission) to publish an advance notice of proposed rulemaking (ANPR) in May 2021 to consider whether there may be unreasonable risks of injury and death associated with ROVs/UTVs. The ANPR began a rulemaking proceeding under Sections 7 and 9 of the Consumer Product Safety Act (CPSA).

The ANPR considered fire hazards for all off-highway vehicles (ATVs, ROVs, and UTVs) and debris penetration hazards for ROVs and UTVs. This draft proposed rule will address only debris penetration hazards in ROVs and UTVs.[1]

This briefing package summarizes the analyses performed by CPSC staff on these areas:

- Review of SEA's test data and engineering analysis
- Examination of proposed performance requirements and test protocol
- Assessment of current voluntary standards for ROVs/UTVs; and
- Summary of ROV/UTV debris penetration-related comments that were received in response to the 2021 ANPR and staff's responses to those comments.

The briefing package presents CPSC staff's recommendations for a proposed rule, followed by a preliminary regulatory analysis that discusses the potential benefits and costs of the draft proposed rule requirements, along with an initial regulatory flexibility analysis that discusses the potential impact of the draft proposed rule on small businesses.

Staff recommends that the Commission publish a notice of proposed rulemaking (NPR) to address debris penetration hazards associated with ROVs/UTVs.

II. DISCUSSION

A. Product Review

1. Description

ROVs

An ROV is a motorized vehicle designed for off-highway use, with these features: four or more wheels with tires designed for off-highway use; non-straddle seating for one or more occupants; a steering wheel for steering controls; foot controls for throttle and braking; and a maximum vehicle speed greater than 30 miles per hour (mph). ROVs are typically equipped with Rollover Protective Structures (ROPS), seat belts, and other restraints, such as doors, nets, and shoulder bolsters for the protection of occupants.

There are two distinct ROV varieties: utility-type ROVs and recreational-type ROVs. Models emphasizing utility have larger cargo beds, greater cargo capacities, and lower top speeds. Models emphasizing recreation have smaller cargo beds, lower cargo capacities, and higher top speeds. Both types of ROVs will be included in the scope of the rule recommended by staff.

At least one ROV manufacturer offers youth-oriented ROVs, which are smaller versions of the full-size ROVs. These youth-oriented ROVs have smaller diameter tires, lower ground

[1] At the ANPR stage, the Commission noted that because the rulemaking involved three vehicle types and two different hazard patterns, it was possible that the Commission would divide the rulemaking into separate rulemakings at the notice of the proposed rulemaking (NPR) stage. Accordingly, this draft proposed rule will address the debris penetration hazard associated with ROVs and UTVs. Staff intends to address fire hazards associated with ATVs, ROVs, and UTVs in a separate rulemaking.

clearance, and less suspension travel; therefore, there is less exposed space in the front wheel well area for a branch to thread between the steering/suspension components and the wheel to penetrate the occupant compartment. Given the low ground clearance and wheel-well configuration of youth-ROVs, as well as the lack of debris penetration incident data involving these vehicles, youth ROVs are not included in the scope of the proposed rule.

UTVs

UTVs have physical characteristics like ROVs. However, UTVs generally have maximum speeds between 25 and 30 mph. UTVs are included in the scope of the draft proposed rule.

Figure 1 - Left to Right: Typical Utility-Type ROV, Typical Recreational-Type ROV, and Typical UTV

2. ROV/UTV Market (See Tab B)

Manufacturers

The number of manufacturers marketing ROVs in the United States has increased substantially since their introduction in the late 1990s. The first utility vehicle that exceeded 30 mph, thus, putting it into the ROV category, was introduced in the late 1990s. No other manufacturer offered an ROV until 2003.

CPSC staff identified 35 manufacturers known to have supplied ROVs and UTVs to the U.S. market in 2019; 17 from the United States, 14 from China (including Taiwan), and one each from Canada, Mexico, South Korea, and Spain. Additionally, there are 48 distributers/brands. CPSC staff estimated U.S. manufacturers accounted for approximately 83 percent of 2019 United States ROV and UTV sales. Furthermore, staff estimates that current members of the Recreational Off-highway Vehicle Association (ROHVA) and/or the Outdoor Power Equipment Institute (OPEI) manufactured approximately 95 percent (see Figure 2).

Directorate for Economic Analysis (EC) staff identified 461 different ROV and UTV model variants and configurations sold in the United States in 2019. Excluding variants and configurations that appear to be based on a common base model, EC staff estimated that there may be as few as 107 unique models introduced in 2019, and a total of 672 models in use by consumers.

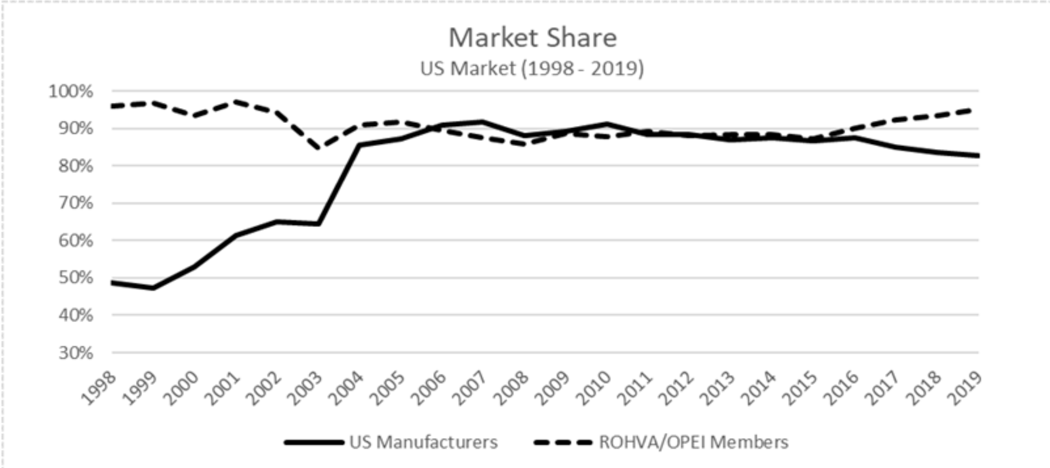

Figure 2 – Market Share

Retail Prices

In 2019, ROV and UTV manufacturer's suggested retail prices (MSRP) ranged from a minimum of $4,599 to a maximum of $53,700. When weighted by sales volume, the mean MSRP is approximately $14,302 for ROVs and UTVs. The 2019 average price continues a recent trend of increasing average MSRPs (see Figure 3). Prior to 2013, the average ROV and UTV MSRP showed a downward trend. Beginning in 2013, however, the average ROV and UTV MSRPs has increased steadily. This trend appears to be driven by increasing sales of more expensive models and higher maximum MSRPs.

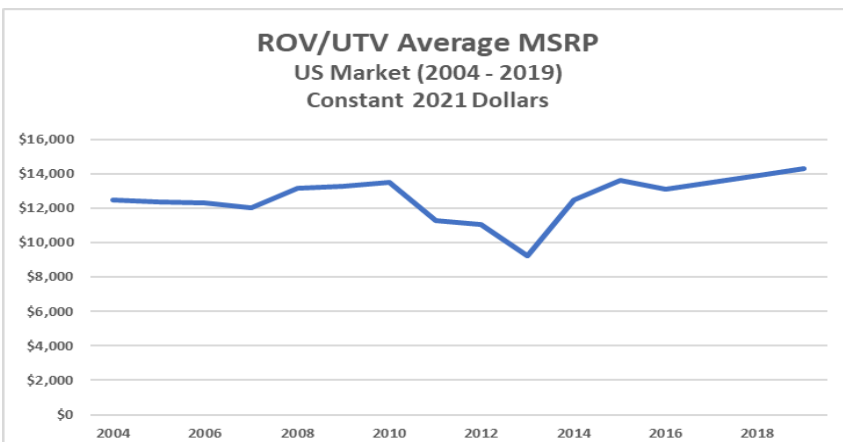

Figure 3 – ROV/UTV Average MSRP

Sales and Number in Use

Except for 2009, annual sales of ROVs and UTVs in the United States have increased steadily from an estimated 35,041 units in 1998 to 429,135 units in 2019. Staff estimates the 2019 US

ROV and UTV sales revenue at approximately $6.87 billion. Figure 4 illustrates combined ROV and UTV unit sales from 1998 through 2018.

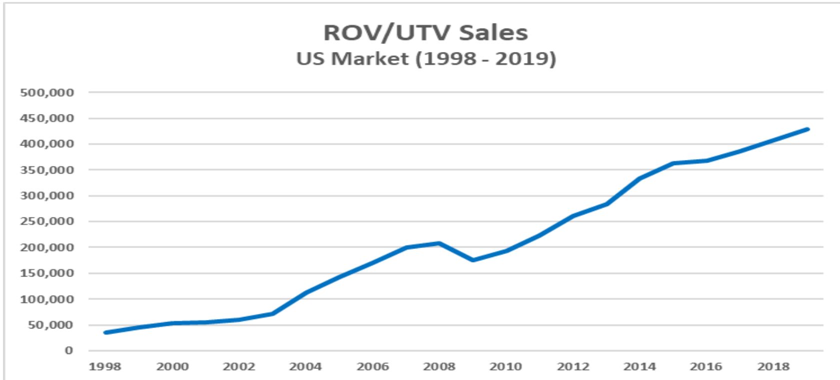

Figure 4 – Combined Sales of ROVs and UTVs

EC staff estimates there were 2.34 million ROVs and UTV in use in the United States in 2019. These estimates were developed using a distribution of failure rates applied to the average ROV and UTV product life.

B. Incident Data and Hazard Characteristics (See Tab D)

CPSC Epidemiology staff reviewed National Electronic Injury Surveillance System (NEISS) injury cases and CPSC's Consumer Product Safety Risk Management System (CPSRMS) injury cases that occurred in the period from 2009 to 2021. Staff searched for debris penetration incidents involving ATVs, ROVs, and UTVs.

Debris penetration involves debris (usually a tree branch or stick) penetrating the occupant area of an OHV (usually through the floorboard of underside of an ROV or UTV). When such penetration occurs, there is a potential hazard of the branch or other debris penetrating far enough into the OHV to harm occupants. None of the debris penetration incidents involved an ATV (other than an ROV mischaracterized as an ATV). Given that ATVs lack floorboards, with the rider sitting astride the engine and drive train, lack of debris penetration incidents involving ATVs was not unexpected. Because of this, ATVs are not included within the scope of this draft proposed rule.

Between 2009 and 2021, there were a total of 107 incidents involving floorboard debris penetration; 104 of these incidents were found in CPSRMS and three in NEISS. Staff reviewed those incidents and identified 22 injury cases and six fatal cases that involved floorboard debris penetration. For the six fatal incidents, two involved death of a passenger, while the other four involved death of the driver. Four involved a tree branch, one a large stick, and the other a 2- to 3-inch piece of wood. At least three involved penetration of the chest. Paraphrasing text written by the respective CPSC investigators for each of the six fatal incidents:

- tree limb penetrated the floor board and struck 28-year-old male passenger in chest (driven in water);
- tire over tree limb that pierces fender, nylon mesh door, and left side of 42-year-old female driver (driven in woods);
- passed over a large stick that was sticking up in the ground that passed through brake pedal arm through bottom edge of seat and into lower abdomen of 55-year-old male driver (driven in power line clearing);
- impaled by a 2- to 3-inch-size piece of wood in upper right thigh, causing exsanguination of 26-year-old female driver (driven on heavily forested public land);
- branch penetrated bottom of UTV and struck 52-year-old female passenger in chest (driven along trail);
- ran over large tree branch that struck 22-year-old male driver in chest (driven in mountains).

Table 1 presents the severity of the 22 nonfatal injury incidents resulting from debris penetration.

Table 1: Reported Incidents of Debris Penetration Hazards by Injury Severity (2009-2020 NEISS, 2009-2021 CPSRMS)

Injury Severity	Incidents
Treated and Released, or Released Without Treatment	2
Hospital Admission	4
Emergency Department Treatment Received	3
First Aid Received by Non-Medical Professional	1
No First Aid or Medical Attention Received	2
Level of care not known	10
Total Injury Incidents	22

Source: CPSRMS and NEISS.

In Tab A of the May 2021 ANPR, there was a discussion of some nonfatal severe injuries. In one IDI, when the driver was impaled, he suffered injuries to his stomach, liver, pancreas, and spleen. He required surgery to treat these injuries. In another IDI, a passenger suffered ankle abrasions. As discussed in Tab A of this NPR package, the types of nonfatal injuries included bruised feet, a tibia bone injury, leg scrapes, and calf lacerations.

C. Compliance Activities

Based on a search from 2002 to 2021, there were three debris penetration hazard recalls, which involved only ROVs.

CPSC recall data include the number of affected vehicles, number of incidents, and injuries associated with the recalls. CPSC staff determined that an incident typically involves penetration of the ROV by a foreign object, usually a tree branch, through the floorboard, or a foreign object generating floorboard holes or cracks. ROV manufacturers generated the recall data; the data are not associated or related to CPSC Epidemiology staff's injury and death analyses (Tab D) or Engineering Sciences assessment (Tab A).

Collectively, over the period 2014 through 2016, there were three recalls associated with approximately 55,000 recalled vehicles, 630 incidents, and 10. There were no deaths associated with ROV debris penetration hazard recalls.

Tab E contains the Compliance recall information pertaining to ROVs.

III. STAFF ANALYSIS

A. Overview of Technical Analysis (See Tab A)

CPSC staff contracted with SEA, Limited (SEA), to quantify the speed and energy necessary for debris (*e.g.*, stick or branch) to penetrate an ROV floorboard. SEA conducted full-scale outdoor tests with a robotic-controlled ROV, in addition to controlled laboratory tests with mock-up ROVs on SEA's sled facility. Although SEA's study was conducted on ROV models, the concepts, observations, and discussions will also apply to UTV models, given the floorboard and UTV front architectures are similar, and in some models, the same as ROV models. As part of this analysis, SEA reviewed debris penetration IDIs provided by CPSC staff. The following analysis is based on the report generated by SEA for this effort.[2]

<u>In-Depth Investigation (IDI) Review</u>

SEA's review of the in-depth investigations (IDIs) determined that a common pattern in most of the severe injury accidents was that a branch or stick, of 1-inch diameter or more, penetrated the suspension components of the vehicles and hit the upper floorboard (the vertical part in front of the occupants' feet or lower legs) or the firewall[3] (the part in front of the occupants' torso). Typically, the stick was longitudinal to the vehicle and positioned at an upward angle. The end of the stick closest to the vehicle was high enough to get above or between the front suspension components. The end of the stick farther from the vehicle was either attached to a larger piece of wood or embedded in the ground. SEA observed that sticks penetrating the vehicle's occupant space were generally straight, and could have diameters as high as 5 inches, or as small as 1¼ inches.

<u>Full-Scale Outdoor Tests</u>

[2] Heydinger, Gary, et. al., "Study of Debris Penetration of Recreational Off-Highway Vehicle (ROV) Floorboards," December 2021. Website URL: https://www.cpsc.gov/content/Study-of-Debris-Penetration-of-Recreational-Off-Highway-Vehicle-ROV-Floorboards.

[3] On many ROVs/UTVs, there are two plastic floor panels. The main floorboard panel covers the floor and footwell areas in front of the feet. A second, semi-vertical plastic panel that is joined to the main floorboard is often known as the firewall, which is located higher up, at the knee level and above.

SEA conducted full-scale outdoor tests designed to simulate branch/stick penetration, by propelling an autonomously driven ROV onto a 2-inch diameter oak dowel with its tip positioned so the dowel would pass through the vehicle's suspension and impact the vehicle's floorboard or firewall sections. In one of the test runs, the dowel traveled through a space above the suspension control arms, and in the other run, the dowel traveled between the control arms. The impact speed for both runs was 10 mph, and in both test runs, the dowel fully penetrated the original equipment manufacturer (OEM) floorboard/firewall and extended into the occupant compartment of the vehicle. Both tests duplicated events that occurred in the IDI incidents. The tests showed that a dowel can interact with suspension components that can influence the trajectory of the dowel and the way the dowel penetrates the floorboard (see Figure 5). The vehicle colliding with a stationary dowel will allow the dowel to experience both compressive and bending forces. The bending forces caused the dowel to snap after impact when the robotic ROV was traveling at 10 mph.

Figure 5 – Illustration of Wheel Well Target Zones (Left); Dowel Penetration Where the Dowel Passed Through Zone 2 Control Arm Components (Right)

Tests on SEA's Indoor Sled Test Facility

SEA designed a test sled that could mount OEM ROV frames and add weights to match the weight of a fully loaded ROV. This design allowed for interchanging floorboards, firewalls, and aftermarket floorboard guards to test under different ROV configurations. The sled rides on a rail installed in a long trench in the floor and is cable driven. Sled tests allowed SEA to simulate impact of a fully loaded ROV (gross vehicle weight that includes occupants) onto a stationary 2-inch diameter oak dowel with its tip positioned so the dowel would impact the vehicle's floorboard or firewall sections at similar locations identified in full-scale robotic ROV outdoor tests and in SEA's review of debris penetration IDIs.

SEA conducted sled tests on floorboards and aftermarket floorboard guards from five different ROV models. A total of 21 test trials were conducted at nominal impact speeds of 2.5 mph, 5.0 mph, and 10.0 mph. Eight of the sled tests were conducted using only OEM floorboard and firewall sections, without any aftermarket guards. All eight of the 2.5 mph and 5.0 mph impact tests on the OEM floorboard/firewall sections resulted in full dowel penetration outcomes. Therefore, no tests on the OEM floorboard/firewall sections without aftermarket guards were conducted at 10 mph.

The sled tests showed that the stock floorboards for two ROV manufacturers experienced debris penetrations at speeds as low as 2.5 mph. The stock floorboards for all five ROV brands experienced debris penetration at 5 mph. Staff concludes that the OEM floorboards supplied with ROVs/UTVs offer inadequate protection to the ROV/UTV occupants if debris penetration can occur at speeds as low as 2.5 mph.

Thirteen sled tests were conducted using four vehicle model frames with aftermarket guards installed. During 5 mph runs, four of the eight aftermarket guards prevented dowel penetration into the occupant compartment, and four allowed dowel penetration into the occupant compartment. The four aftermarket guards that prevented dowel penetration during 5 mph impacts were tested at 10 mph; three of these guards failed to prevent dowel penetration into the occupant compartment. For those tests in which the aftermarket guard prevented dowel penetration into the occupant compartment, the guard redirected the penetrator dowel off to the side or upwards instead of directly absorbing the high impact energy. In such cases, the bending forces caused the dowel to snap off. In some instances, the sled yawed and pitched before the simulated ROV sled came to a complete stop. These results demonstrated successful protection of the occupants from impalement by branch penetration into the occupant area of the vehicle.

Based on the test data collected, SEA concluded:

- A 2-inch diameter oak dowel can pass between the front suspension components and penetrate the plastic OEM floorboard/firewall at vehicle speeds of 2.5 mph and 5.0 mph.
- If better guards are to be designed, it is likely that they will not work by absorbing energy, but rather, by redirecting the dowel and/or causing the dowel to bend and snap.
- Guards that worked well in the sled testing tended to work well because they pushed the dowel up and/or to the side. Ideally, the guards and/or improved floorboards would force the dowel to push to the side of the vehicle and outside the zone of the occupant compartment.
- Testing showed that a successful design for an aftermarket guard or OEM floorboard could involve deflecting the dowel, rather than taking on the force directly. Several of the aftermarket guards were successful at doing this at 5 mph, and one of the guards tested was successful at 10 mph.

B. Proposed Requirements for Draft Proposed Rule

SEA's sled testing showed that dowel penetration can occur at speeds as low as 2.5 mph on ROVs equipped with standard OEM floorboards. Multiple full-scale tests re-created stick/branch penetration in the occupant area, a hazard reported in at least 107 incidents, six resulting in fatalities. Stick/branch penetration of floorboards poses impalement and/or laceration hazards and the risk of serious injury or death. Therefore, staff concludes that ROVs and UTVs equipped with current ROV/UTV floorboards are inadequate and offer minimal-to-no protection to the occupants in debris penetration events.

To reduce deaths and injuries associated with the debris penetration hazards, staff recommends a performance requirement and a test procedure that propels a test vehicle or simulated vehicle sled at a minimum speed of 10 mph towards a stationary 2-inch diameter oak dowel, positioned at an angle between 12° and 25,° to strike the front wheel suspension area of the vehicle. The performance requirement specifies that the dowel cannot penetrate the occupant area when tested to the proposed impact test procedure (see Tab A).

For the majority of the IDIs that had vehicle speed information, 66 percent (27 out of 41 IDIs) of the debris penetration events occurred at 10 mph or less (See Tab A - Engineering Sciences Memorandum). Staff concludes a test vehicle or simulated vehicle sled colliding with a stationary 2-inch diameter oak dowel at 10 mph represents a realistic debris penetration scenario. The requirement will reduce the likelihood of impalement and/or lacerations from debris penetration, by preventing penetration into the occupant area of these vehicles. The SEA testing showed that an aftermarket floorboard guard can prevent debris penetration at 10 mph. Instead of energy absorption, this aftermarket guard redirected the dowel, allowing the bending forces to snap the dowel. Staff determined that it is likely that floorboards or the wheel-well area of ROVs/UTVs can be designed to resist debris penetration by redirecting the dowel to the side or upwards to avoid injuring the occupants. This type of mitigation design would also be effective at higher vehicle speeds.

C. Preliminary Regulatory Analysis

The Directorate for Economic Analysis (EC) conducted a preliminary regulatory analysis of the draft proposed rule that is included at Tab B. The main findings are summarized below:

1. Societal Cost of Fatal and Nonfatal Injuries

The intent of the draft proposed rule is to reduce the risk of injury and death associated with the ROV/UTV debris penetration hazard. Therefore, the main benefits of the draft proposed rule are reductions in the societal costs of injuries and deaths associated with ROV/UTVs.

To estimate the benefits of the proposed rule, staff produced forecasts of the number of deaths and injuries assuming that the death and injury rates per million ROVs/UTVs remain consistent with the average rates per vehicles in use observed in the injury databases during the period 2010 to 2019 (*i.e.*, 0.36 deaths, 0.24 hospital admissions, 0.24 emergency department admissions, and 0.72 doctor/clinic visits per million ROVs/UTVs in use). Staff then forecasted the number of ROV/UTV sales for the 30-year study period used in this analysis, 2024 to 2053, using 2005 to 2019 records of ROV/UTV sales from the North American Utility Vehicle Sales provided by Power Products Marketing, Eden Prairie, MN (2020). Staff then used the forecast of the number of ROV/UTV sales to estimate the number of ROV/UTVs in use each year of the 30-year period of analysis. Finally, staff multiplied the death and injury rates by the number of ROV/UTVs in use each year, to estimate the total number of deaths and injuries for every year in the 30-year study period.

Using a value of a statistical life (VSL) of $10.5 million (2021 dollars), staff estimated that the societal costs from deaths would be $568.3 million from 2024 through 2053, in the absence of this draft proposed rule. Using the injury cost model (ICM) estimates of societal cost per injury,[4] staff estimated the societal cost of the nonfatal injuries reported through CPSRMS and NEISS to be $6.39 million. The estimated societal cost of deaths and injuries in the absence of the draft proposed rule would be $574.69 million over the study period (2024-2053). However, the draft proposed rule might not mitigate all the deaths and injuries from debris penetration. It is expected that approximately 95 percent of all incidents would be avoided because of the new performance requirements would prevent debris penetration at 10 mph and below, and significantly mitigate incidents above 10 mph (see page 30 of Tab A for an explanation on the decreasing likelihood of debris penetration incidents above 10 mph). Staff supplements its assessment of a 95 percent efficacy rate with a sensitivity analysis that reduces the efficacy rate to 60 percent in Tab B. Sixty percent represents an approximation of the share of debris penetration incidents that occurred when vehicles were traveling 10 mph or below. Staff welcomes public comment on both the 95 percent and 60 percent efficacy rates used in the preliminary regulatory analysis. The efficacy rate would not be reached immediately because there would still be noncompliant ROVs and UTVs in use during the early years of the rule (*e.g.*, ROVs/UTVs still in use but sold prior to the implementation of the rule). To account for this, staff estimated the percentage of noncompliant ROVs and UTVs in each year of the analysis and adjusted the benefit estimates accordingly. After these adjustments, staff estimates that, from 2024 through 2053, an aggregate $510.45 million in societal cost would be avoided if the CPSC promulgated the draft proposed rule. The present value of this 30-year stream of benefits discounted at a 3 percent discount rate is $303.15 million. Staff converted the aggregate benefits over the 30-year period of study to an annual equivalent of $15.47 million. This equates to $12.08 in benefits per ROV/UTV adapted to the requirements of this draft proposed rule.

2. Resistance to Debris Penetration Requirements

The resistance to debris penetration requirements of the draft proposed rule are intended to reduce impalement and laceration risks. The proposed performance requirement specifies that a stationary 2-inch diameter oak dowel, longitudinally angled at the front wheel suspension area of a test vehicle, or simulated vehicle sled moving towards the dowel at a minimum speed of 10 mph, cannot penetrate the occupant area of the vehicle. Manufacturers can meet the proposed performance requirement by improving the strength of the floorboard and/or redesigning the wheel-well area of ROVs/UTVs to resist debris penetration by redirecting the dowel to the side or upwards to avoid injuring the occupants, or other means to reduce the risk of the debris penetration hazard.

3. Costs to Manufacturers

[4] The societal cost estimates include the cost of medical treatment, lost worktime, and intangible pain and suffering costs. Using the ICM, staff estimated place-of-treatment based costs estimates for ROV/UTV debris penetration injuries in 2021 dollars as $17,013 per injury treated at a doctor's office or clinic, $24,694 per injury treated at an emergency department, and $101,433 per injury requiring a hospital admission.

In assessing costs, staff considered two solutions to the debris penetration hazard under the draft proposed rule: (i) a fully redesigned floorboard that uses most of the material in original floorboards, and (ii) floorboards with floorboard guards. Both scenarios are effective in preventing debris penetration at 10 mph and below, and mitigating debris penetration above 10 mph. Both scenarios require manufacturers to redesign existing models to allow proper installation of the floorboard solution of choice. In the preliminary regulatory analysis (Tab B), staff estimates the total cost for each scenario assuming firms implement that each floorboard solution solely. In reality, firms will likely vary in which solution they implemented, or come up with a solution of their own. By estimating costs for each solution exclusively, staff can provide a range of cost estimates that the actual cost of the rule will fall between with a high degree of certainty.

Staff estimates that manufacturers will incur costs ranging from $181.49 million (redesigned floorboards) and $304.43 million (floorboard guards)[5] over the 30-year period of analysis, discounted at a 3 percent discount rate. These costs include the expense of redesigning ROV/UTV models in use at the time of implementation of the rule, as well as the production of floorboards to be installed on all new ROV/UTVs. The annualized costs at 3 percent are $9.26 million for the redesigned floorboards scenario and $15.53 million for the floorboard guard scenario. The per-unit cost of each compliance scenario is the total cost of the scenario, divided by the number of ROVs and UTVs with the corresponding debris penetration fix over the 30-year period. In the redesigned floorboard scenario, the cost per unit is $7.23. In the floorboard guard scenario, the cost per unit is $12.13.

4. Net Benefits

Staff compared estimated benefits and costs to assess the net benefits of the draft proposed rule and the relation between benefits and costs. In the redesigned floorboard scenario, the total net benefits discounted at a 3 percent discount rate are $121.64 million over the 30-year period of analysis ($303.13 million in benefits minus $181.49 million in costs), which produces an annual equivalent of $6.21 million per year. In the floorboard guard scenario, the total net benefits discounted at a 3 percent discount rate are $-1.28 million over the 30-year period of analysis ($303.15 million in benefits minus $304.43 million in costs), which produces an annual equivalent of $-0.07 million per year. The ratio of benefits to costs is between 1.00 (floorboard guards scenario) and 1.67 (redesigned floorboards scenario), while the net benefits per vehicle are in the range of $-0.05 (floorboard guard scenario) and $4.84 (redesigned floorboards scenario).

D. Initial Regulatory Flexibility Analysis

[5] While staff estimates floorboard guards to be the more expensive solution, this may not be the case for every firm or ROV/UTV model. Staff estimates cost for the two scenarios because they are plausible solutions to comply with the proposed performance requirements. In reality, firms will likely vary in which solution they implement, or come up with a solution of their own. However, by estimating costs for each solution exclusively, staff can provide a range of cost estimates that the actual cost of the rule will fall between with a high degree of certainty.

The Directorate for Economic Analysis (EC) conducted an initial regulatory flexibility analysis of the draft proposed rule that is included at Tab C. The main findings are summarized below.

Staff identified seven manufacturers that meet U.S. Small Business Administration (SBA) criteria to be considered small firms. For five of these firms, redesign, retooling, and testing costs incurred in the first year are likely to exceed 1 percent of annual revenue, which could be considered a significant economic impact. Staff identified 19 possible importers of foreign-manufactured ROVs and UTVs that meet SBA criteria to be considered small, or for which a size determination could not be made. Small importers may need to find alternative sources if their existing supplier does not come into compliance with the proposed rule. However, it is likely that many foreign manufacturers will continue to produce ROVs/UTVs to U.S. standards to exploit rising popularity and sales of these vehicles. Small importers could experience a significant economic impact if required to conduct testing to support a General Certificate of Conformity (GCC). For 13 of the 19 possible small importers identified, such testing costs could exceed 1 percent of annual revenue, and thus, be considered significant costs. However, staff expects most small importers will rely on certifications or testing performed by their suppliers.

IV. VOLUNTARY STANDARDS

ANSI/ROHVA 1 American National Standard for Recreational Off-Highway Vehicles

The Recreational Off-Highway Vehicle Association (ROHVA) developed ANSI/ROHVA-1 American National Standard for Recreational Off-Highway Vehicles, which, sets mechanical and performance requirements for ROVs. The most recent version of ANSI/ROHVA-1 was published in 2016. The ANSI/ROHVA-1-2016 standard defines an “ROV” as a motorized off-highway vehicle designed to travel on four or more tires, intended by the manufacturer for recreational use by one or more persons and having the following characteristics:

- A steering wheel for steering control
- Foot controls for throttle and service brake
- Non-straddle seating
- Maximum speed capability greater than 30 MPH
- Gross Vehicle Weight Rating (GVWR) no greater than 1700 kg (3750 lbs)
- Less than 2030 mm (80 in) in overall width,
- Engine displacement equal to or less than 1,000 cc for gasoline fueled engines
- Identification by means of a 17-character PIN or VIN.

The standard addresses design, configuration, and performance aspects of ROVs, including requirements for accelerator and brake controls; service and parking brake/parking mechanism performance; lateral and pitch stability; lighting; tires; handholds; occupant protection; labels; and owner’s manuals. The latest version of the standard added vehicle handling requirements and enhanced seat belt reminder requirements to address rollover and occupant ejection hazards associated with ROVs. ANSI/ROHVA 1-2016 does not have requirements to address debris penetration into the occupant area of the vehicle.

ROHVA member companies include: Textron (formerly known as Arctic Cat), Bombardier Recreational Products (BRP), Honda, John Deere, Kawasaki, Polaris, and Yamaha. Work on ANSI/ROHVA-1 started in 2008, and work was completed with publication of ANSI/ROHVA 1-2010. The standard was immediately opened for revision, and a revised standard, ANSI/ROHVA 1-2011, published in July 2011. The most recent version published in 2016.

ANSI/OPEI B71.9 American National Standard for Multipurpose Off-Highway Utility Vehicles

Some ROV manufacturers that emphasize the utility applications of their vehicles, worked with the Outdoor Power Equipment Institute (OPEI) to develop ANSI/OPEI B71.9 American National Standard for Multipurpose Off-Highway Utility Vehicles. The most recent edition of the OPEI standard published in 2016. ANSI/OPEI B71.9 defines a “multipurpose off-highway utility vehicle” (MOHUV) as a vehicle having features specifically intended for utility use and having these characteristics:

- Intended for transport of one or more persons and/or cargo, with a top speed more than 25 mph;
- Overall width of 2040 mm (80 in) or less
- Designed to travel on four or more wheels, two or four tracks, or combinations of four or more wheels and tracks;
- Use of a steering wheel for steering control;
- Equipped with a non-straddle seat;
- With a Gross Vehicle Weight Rating of no more than 1814 kg (4000 lbs.); and
- Outfitted with a minimum cargo capacity of 159 kg (350 lb).

MOHUVs with maximum speed capabilities between 25 and 30 mph considered “UTVs,” as defined by CPSC staff. MOHUVs with maximum speed capabilities greater than 30 mph are considered to be ROVs. The standard includes requirements for accelerator and brake controls; service and parking brake/parking mechanism performance; lateral and pitch stability; lighting; tires; handholds; occupant protection; labels; and owner’s manuals. The latest version of the standard added vehicle handling requirements and enhanced seat belt reminder requirements (that are identical to the requirements in ANSI/ROHVA 1-2016) for vehicles with maximum speeds greater than 30 mph to address rollover and occupant-ejection hazards associated with ROVs. ANSI/OPEI B71.9-2016 does not have requirements to address debris penetration into the occupant area of the vehicle.

OPEI member companies include: Honda, John Deere, Kawasaki, and Yamaha. Work on ANSI/OPEI B71.9 started in 2008, and they completed with the publication of ANSI/OPEI B71.9-2012 in March 2012. The most recent version published in 2016.

Neither standard has requirements to address debris penetration into the occupant area of the vehicles.

CPSC Staff/Voluntary Standard Activity

In September 2018, CPSC staff met with members of OPEI and ROHVA to discuss staff's concerns with debris penetration hazards. Since then, staff provided OPEI and ROHVA with recall and incident data detailing the frequency with which the occupant area of UTVs and ROVs have been breached by sticks/branches and advising of the deaths and injuries resulting from these debris penetration events. At the most recent meeting on November 9, 2021, OPEI and ROHVA members shared their exploratory work on test methods to evaluate debris penetration hazards and expressed an interest in collaborating with CPSC staff on the issue. To date, however, neither voluntary standard has requirements that address debris penetration into the occupant area of the vehicle, and staff does not anticipate ballots from either organization that address the hazard.

V. RESPONSES TO ANPR COMMENTS

In this section, staff describes and responds to ROV/UTV debris penetration-related comments to the ANPR for ROVs/UTVs. The Commission published the Off-Highway Vehicle (OHV) Fire and Debris Penetration Hazards Advance Notice of Proposed Rulemaking (ANPR) in the *Federal Register* on May 11, 2021. The public comment period ended on July 12, 2021. CPSC received 10 comments from the public, which can be found at docket number CPSC-2021-0014, at: www.regulations.gov. Four of the comments support the rulemaking; six of the comments do not support the rulemaking. We respond to the comments pertaining to debris penetration hazards below.

The following are comments and CPSC staff's responses.

Comment: Four comments express support for the rulemaking. Three of these comments note that voluntary standards for ROVs and UTVs fail to adequately protect consumers, given the injuries, deaths and incidents that have occurred related to debris penetration. In addition, these three comments note that the voluntary standards do not include any requirements to protect against debris penetration. One comment mentions that research shows a correlation between mandatory standards on products and a reduction of regulated product-specific deaths.

Response: Staff concurs with these comments because the current voluntary standards, ANSI/ROHVA-1-2016 and ANSI/OPEI B71.9-2016, do not have resistance to debris penetration performance requirements that adequately protect consumers, given the injuries, deaths, and incidents that have occurred related to debris penetration.

Comment: Another comment notes that the rulemaking should account for the unique hazards of OHVs used by children, especially for "youth model" products marketed toward younger drivers.

Response: At least one ROV manufacturer offers youth-oriented ROVs that are smaller versions of the full-size ROVs. Given the low ground clearance and wheel-well configuration of youth-ROVs, as well as the lack of incident data involving these vehicles, staff did not include these products in the scope of this draft proposed rule.

Comment: Two comments state that it is not clear whether the debris penetration hazard incidents were caused by lack of clear sight, user error, or whether the driver and/or passenger were impaired. One of these comments also states it is unclear when the product is becoming dangerous due to “improper installation, inspection, operation, and/or maintenance.”

Response: Staff examined incident data that showed debris penetrations were occurring at speeds as low as 2 mph (Engineering Sciences Memorandum Tab A). Staff found that such debris penetrations occur in non-severe conditions. Consequently, staff concluded there was a performance issue to address with the vehicle rather than the operator’s behavior. By their nature, ROVs and UTVs are intended to be driven on off-highway environments. It is completely foreseeable that the vehicle may encounter sticks or branches and suffer penetration of a stick/branch into the vehicle’s cabin area, even at such a low speed, which staff found is indicative of insufficient debris resistance of the vehicle. A vehicle intended to be driven in off-highway environments should not be susceptible to debris penetration at such low-speeds, regardless of maintenance or inspection of the vehicle.

Comment: Four comments advocate addressing debris penetration hazards through the voluntary standards process instead of through rulemaking.

Response: Although CPSC staff has engaged with the standards development organizations (SDOs), no substantial progress was made regarding debris penetration hazards. The three SDOs and CPSC staff met multiple times, in-person and virtually, since 2018, to discuss debris penetration hazards, but no substantial progress has been made and discussions remain in the preliminary idea phase. CPSC staff will continue to engage with these SDOs, to review any proposals they may present, and consider those proposals as staff continues with its rulemaking activities.

Comment: Two comments assert that the Commission should withdraw its ANPR because it lacks sufficient information to determine that there is an “unreasonable risk of injury” associated with debris penetration hazards and that debris penetration incidents are rare and involve “highly dissimilar factors,” making them unsuitable for consideration for mandatory rulemaking.

Response: Staff has determined that six deaths and 22 injuries resulted from ROV debris penetration. By design, ROVs/UTVs are used in off-highway environments, where driving over tree branches is likely to occur.

ROVs/UTVs are marketed as intended to be used in forested trails, farms, or other off-highway environments. The versatile utility of ROVs/UTVs, combined with their use in off-highway environments, where tree branches on the ground are commonplace, leads to increased exposure to the debris penetration hazard. There is the reasonable expectation that a vehicle designed for use in forested trails should be capable of driving safely with tree branches on the ground.

Staff disagrees with the comment that debris penetration incidents involve “highly dissimilar factors.” As detailed in Tab A (Engineering Sciences Memorandum), for 44 percent of the IDIs that had information regarding vehicle speed at the time of debris penetration, the vehicle speeds during collisions with tree branches were 5 mph or less. These data suggest consumers were generally not reckless and the ROV/UTV floorboard debris penetrations are occurring under non-severe conditions. Staff believes that this lends support to a preliminary determination by the Commission that such debris penetration presents an unreasonable risk of injury.

Like an automobile collision, these debris penetration accidents can occur in fractions of second, where death or serious injury can happen quickly and unexpectedly. Because ROVs and UTVs are intended for off-highway use, including use in wooded environments and dirt trails, consumers may not expect that debris could penetrate these vehicles, even at low speeds. Staff assesses that the unexpected nature of this hazard while using the product as intended also lends support to a preliminary determination by the Commission that debris penetration in ROVs and UTVs poses an unreasonable risk of injury or death.

CPSC contractor SEA procured aftermarket floorboard guards from seven different vendors for their test program. The fact that there is already a robust market for this type of product suggests debris penetrations are occurring often enough that there is substantial consumer interest in products to potentially remedy the risk of debris penetrations.

VI. STAFF RECOMMENDATION

As of December 31, 2021, staff is aware of at least 107 reports of debris penetration in the occupant area of a UTV or ROV. Of these, CPSC staff is aware of six fatalities and 22 injuries because of impalement of an occupant by a branch/stick. There were three debris penetration hazard recalls that involved approximately 55,000 vehicles, 630 incidents, and 10 injuries.

CPSC staff's contract research work showed that debris penetration can occur at speeds as low as 2.5 mph on standard OEM ROV/UTV floorboards. Multiple full-scale and controlled laboratory tests re-created stick/branch penetration in the occupant area. Based on staff's technical analysis and the incidents showing the occurrence of debris penetration into the occupant area of ROVs and UTVs, staff concludes that the current ROV/UTV floorboards are inadequate and offer minimal-to-no protection to the occupants in debris penetration events.

To reduce deaths and injuries associated with debris penetration hazards, staff recommends a performance requirement and a test procedure that involve propelling a test vehicle or simulated vehicle sled at a minimum speed of 10 mph towards a stationary 2-inch diameter oak dowel with a length between 39 and 65 inches, positioned at an angle of between 12° to 25° from horizontal to strike the front wheel suspension area of the vehicle. Due to the various shapes, depths, contours, suspension component arrangements, and control arm dimensions of all the ROV/UTV wheel well configurations, a range of angles and a range of dowel lengths are needed. The proposed test requirement specifies that the test target of the floorboard surface must be the location that represents the most adverse location that is most likely to cause debris penetration. The performance requirement specifies that the 2-inch diameter oak dowel cannot penetrate the occupant area when tested to the impact test procedure. The 10-mph speed is within the speed range at which debris penetration has occurred in the IDIs staff reviewed. Staff assesses that the recommended performance requirement and test procedure will reduce the likelihood of impalement and/or lacerations due to debris penetration, by preventing penetration into the occupant area of these vehicles.

SEA's testing showed that an aftermarket floorboard guard can prevent debris penetration at 10 mph. Instead of energy absorption, this aftermarket guard redirected the oak dowel, allowing the bending forces to snap the dowel. It is likely that floorboards or the wheel-well area of ROVs/UTVs can be designed to resist debris penetration by redirecting the dowel to the side, or upwards, to avoid injuring the occupants.

Additionally, CPSC staff recommends that the Commission propose an effective date of 6 months after publication of the final rule for manufacturers to comply with the resistance to debris penetration requirements. Staff concludes that ROV/UTV models that do not comply with the resistance to debris penetration requirements can be modified, with design changes to the floorboards and/or augmentation of floorboard guards, in less than four person-months (at the most) and concludes that these ROV/UTV models can be tested for compliance in 1 day. Therefore, staff concludes that 6 months is a reasonable period for manufacturers to modify vehicles, if necessary; conduct required tests; and analyze test results to ensure compliance with the recommended resistance to debris penetration requirements. Therefore, staff recommends that 6 months from publication of a final rule would be sufficient time for ROVs and UTVs to comply with all the proposed requirements.

TAB A

United States
Consumer Product Safety Commission

Memorandum

TO: Duane Boniface, Assistant Executive Director
Office of Hazard Identification and Reduction

DATE: March 11, 2022

THROUGH: Caroleene Paul, Director
Division of Mechanical and Combustion Engineering

FROM: Han Lim, Project Manager
Division of Mechanical and Combustion Engineering

SUBJECT: Proposed Requirements for Mitigating the Debris Penetration Hazards Associated with Recreational Off-Highway Vehicles (ROVs) and Utility Task/Terrain Vehicles (UTVs)

I. INTRODUCTION

In May 2021, the U.S. Consumer Product Safety Commission (CPSC) published an advance notice of proposed rulemaking (ANPR) [2] to develop a rule to address the risk of injury associated with fire and debris-penetration hazards associated with off-highway vehicles (OHVs). In the ANPR, staff described the vehicles that comprise OHVs: all-terrain vehicles (ATVs), recreational off-highway vehicles (ROVs), and utility terrain or utility task vehicles (UTVs). This notice of proposed rule (NPR) package focuses on debris penetration hazards, which are specific to ROVs and UTVs. Debris penetration hazards are unique to ROVs and UTVs because the wheel-well areas on these vehicles are generally larger and more open, compared to ATVs, which are vehicles straddled by the operator. The larger space in ROVs and UTVs exposes substantial floorboard and wheel-well surface areas to tree branches that can and do penetrate the occupant compartment. Debris penetration through the floorboard or wheel well can impale the occupants of the vehicles, and these incidents have caused severe injuries and deaths. Fire hazards associated with OHVs are not included in this NPR.

In this memorandum, staff will provide the following information:
- Description of products
- Description of hazard
- Assessment of current voluntary standards
- Summary of tests and evaluation conducted by a CPSC contractor
- Recommendation for draft proposed rule

To reduce the risk of injuries and deaths from the debris penetration hazard associated with ROVs/UTVs, CPSC staff recommends that the Commission establish the following performance requirement for ROVs/UTVs: a stationary 2-inch diameter dowel with a length between 39 and 65 inches, longitudinally angled at the front wheel suspension area of a test vehicle or simulated vehicle sled, cannot penetrate the occupant area of the vehicle when the test vehicle or simulated vehicle sled travelling at 10 mph collides with the stationary dowel.

II. DISCUSSION

A. Products subject to draft proposed rule

<u>ROVs</u>

An ROV is a motorized vehicle designed for off-highway use, with the following features: four or more wheels with tires designed for off-highway use, non-straddle seating for one or more occupants, a steering wheel for steering controls, foot controls for throttle and braking, and a maximum vehicle speed greater than 30 miles per hour (mph). ROVs are typically equipped with Rollover Protective Structures (ROPS), seat belts, and other restraints, such as doors, nets, and shoulder bolsters for the protection of occupants.

There are two distinct ROV varieties: utility-type ROVs and recreational-type ROVs. Models emphasizing utility have larger cargo beds, greater cargo capacities, and lower top speeds. Models emphasizing recreation have smaller cargo beds, lower cargo capacities, and higher top speeds. Both types of ROVs are included in the scope of the proposed rule.

<u>UTVs</u>

UTVs have physical characteristics like utility ROVs; however, UTVs generally have maximum speeds between 25 and 30 mph. Both ROVs and UTVs are often called "side-by-sides," abbreviated as "SxS." UTVs are also included within the scope of the draft proposed rule.

Figure 1 - Left to Right: Typical Utility-Type ROV, Typical Recreational-Type ROV, and Typical UTV

B. Hazard

In the ANPR, staff reviewed incidents related to debris penetration and determined that incidents occurred at low speeds of 25 mph or less. In Tab D, Epidemiology staff reviewed 107 ROV/UTV-related incidents that occurred in the period from January 2009 to December 2021, and staff identified 22 injuries and six fatalities. Based on these fatalities and injuries, staff concludes that any penetration by a branch into the occupant area poses an impalement or laceration hazard.

ROVs and UTVs are off-highway vehicles that provide utility and entertainment value. Their intended uses range from farm work, to hunting, to recreation and competitive racing. Given the off-highway, all-terrain capability of ROVs and UTVs, consumers can be expected to operate these vehicles in wooded areas or trails, where these vehicles are expected to be driven over tree branches. The fact that these branches can and have penetrated the occupant area supports a preliminary finding of an unreasonable risk of injury or death to the occupants of these vehicles.

Among the 107 incidents, Engineering Sciences staff examined 53 IDIs (eight IDIs examined in detail in Tab A of the ANPR and 45 IDIs examined post-ANPR). Many IDIs contained information for the estimated vehicle speed at the time of the accident, estimated stick diameter, and information regarding the occupants' seatbelt usage. Table 1 presents the IDI summaries with the information that was available.

Table 1 – Debris Penetration IDI Summaries

	Injury	Estimated Stick Diameter (in)	Estimated Vehicle Speed (mph)	Injured Body Part	Seatbelt Fastened?
1	Death	Unknown	Unknown	Chest	No
2	Yes	Unknown	Unknown	leg pinned against bottom of seat	Unknown
3	No	3 to 4	5	N/A	No
4	No	Unknown	Unknown	N/A	Unknown
5	Yes	1	15 to 20	leg, left tibia bone; abdomen	Yes
6	No	Unknown	15 to 20	N/A	No
7	No	Unknown	15	N/A	No
8	No	Unknown	25	N/A	Unknown
9	No	3	5	N/A	Yes
10	No	3 to 4	5	N/A	No
11	No	4	15 to 20	N/A	Yes
12	No	0.5 to 0.75	8 to 10	N/A	No
13	No	8	2 to 3	N/A	No
14	No	2	5	N/A	Yes

15	No	0.25	5	N/A	Yes
16	No	2	15 to 20	N/A	Yes
17	No	Unknown	Unknown	N/A	Yes
18	No	3 to 4	5	N/A	Yes
19	No	3	Unknown	N/A	Unknown
20	Yes	1	Unknown	Leg	Yes
21	No	2 to 3	20	N/A	Yes
22	No	Unknown	20	N/A	Yes
23	No	Unknown	Unknown	N/A	Unknown
24	No	2	10	N/A	Yes
25	No	1 to 5	10	N/A	Yes
26	Yes	Unknown	5	shin	Yes
27	No	0.75	5	N/A	Yes
28	No	Rocks	0 to 35	N/A	Yes
29	No	Unknown	Unknown	N/A	Yes
30	No	0.25	5	N/A	No
31	Yes	Unknown	Unknown	right calf laceration	Unknown
32	No	Unknown	5	N/A	Yes
33	No	1.5	5	N/A	Yes
34	No	1.5	5 to 10	N/A	Yes
35	Yes	3	5	bruised foot	Yes
36	Yes	3	10	right foot	Unknown
37	No	1.5	15	N/A	Yes
38	No	1.5	Unknown	N/A	Yes
39	No	2.5	5	N/A	Yes
40	No	3	5	N/A	Unknown
41	No	2	5	N/A	Yes
42	No	1	2	N/A	Yes
43	No	3	10	N/A	Yes
44	No	3	10 to 15	N/A	Unknown
45	No	Unknown	20	N/A	Yes
46	Death	Unknown	25	heart	Unknown
47	No	Rocks	5	N/A	Unknown
48	Death	Unknown	5 to 10	viscera	No
49	Death	Unknown	Unknown	chest	Unknown
50	Yes	Unknown	20	abdomen	Yes
51	Yes	1 to 2	20 to 25	ankle abrasion	Unknown
52	Death	2 to 3	Unknown	thigh	Unknown
53	Yes	1 to 1.5	25	liver, stomach, pancreas	Yes

The IDIs identified as 46 to 53 are the same as the eight IDIs that were discussed in detail in Tab A (Engineering Memorandum) of the ANPR. Fifty-one IDIs involved tree branches penetrating the floorboards, whereas two of the IDIs involved rocks breaking through the floorboards. All the IDIs involved ROVs, except IDI 47, which involved a UTV.

Thirty-three IDIs had information regarding stick diameter. Forty-one IDIs had information regarding the estimated vehicle speed at time of impact. Thirty-nine IDIs had information regarding whether seatbelts were fastened during the accidents. For IDIs that had information regarding stick diameter, death or injury occurred from a stick with a diameter between 1 to 3 inches.

IDI interviewees sometimes gave ranges to estimate stick diameters and estimate vehicle speeds in their responses. For example, an interviewee believed a stick that penetrated the floorboard was approximately 1 to 1.5 inches. The average stick diameter for the low range was 2.1 inches and 2.5 inches for the high range. For estimated vehicle speeds, the average speed for the low range was 10.2 mph and 12.1 mph for the high range. Most of interviewees, 66 percent (27 out of 41 IDIs), reported debris penetrations occurring at 10 mph or less.

ROVs and UTVs are marketed as vehicles that can be driven in forested trails, and exposure to the tree branches on the ground is foreseeable. For example, in IDI 32 (Table 1), a firefighter was using an ROV equipped with a water tank and firefighting equipment to put out a brush fire in a grassy area. The firefighter was driving at 5 mph (“walking speed” as described in the IDI) when debris penetration occurred. He noted the tree branch that punctured the floorboard was not visible because it was covered in grass.

In two IDIs where the estimated speed was 5 mph, two consumers experienced injury to their shin and foot (IDIs 26 and 35 in Table 1, respectively). Only one incident (IDI 28 in table 1), included estimated vehicle speeds greater than 25 mph.

Given that ROVs/UTVs are used in forested trails, CPSC staff considers it a reasonable expectation that the floorboards should protect consumers when ROVs/UTVs are operating in these environments.

Debris penetrations occurred two or more times for a single vehicle for some consumers, as described in IDIs 4, 6, 8, 20, 25, 27, and 51 in Table 1. While one instance of debris penetration may seem random and unpredictable, two or more occurrences indicate that the floorboards may not adequately prevent debris penetrations. Staff measured the floorboards of several model ROVs and determined that the average thickness of the plastic floorboards was between 0.1 and 0.2 inches. In addition, staff’s analysis of incident photos indicates brittle failure of the plastic floorboard when penetration occurs, because the floorboard is not able to absorb the high kinetic energy of the ROV floorboard-stick collision. Edges of the holes or cracks are usually clean (*i.e.*, no material stretch indications). Figure 2 is from IDI 36, where a branch penetrated the footrest of the passenger floor.

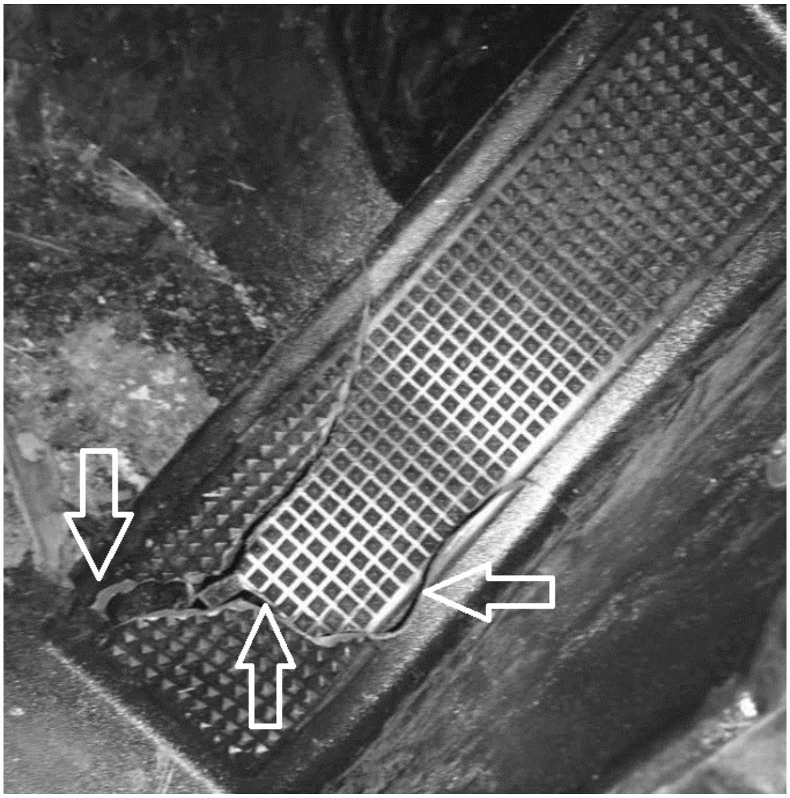
Figure 2 – Debris Penetration Through Passenger Footrest (IDI 36);
Smooth, Clean Break Lines and Edges Indicate Brittle Failure

There were three debris penetration recalls which involved approximately 55,000 vehicles, 630 incidents, and 10 injuries. Tab E contains the details with respect to these recalls.

Based on the testing done by SEA, and the average incident estimated stick diameters and estimated vehicle speeds computed from the incident data, staff selected the test parameters of 10 mph for the vehicle speed and a 2-inch diameter oak wood dowel as the debris penetrator test component. Furthermore, 66 percent of the incidents (27 out of 41 IDIs) involved debris penetrations occurring at 10 mph or less. Staff concludes that these test parameters represent the likely debris penetration hazard scenario. Staff also concludes that if manufacturers design floorboards and/or floorboard guards to comply to the performance and testing requirements, the floorboards may provide adequate protection against debris penetration, and correspondingly, reduce the likelihood of laceration and impalement. Additional details are provided in Appendix A.

C. Voluntary Standards

ANSI/ROHVA-1 [5]

In 2016, the Recreational Off-Highway Vehicle Association (ROHVA) published the latest version of the standard -- ANSI/ROHVA-1 – 2016, American National Standard for Recreational Off-Highway Vehicles. The first version of the standard published in 2010.

The ANSI/ROHVA-1-2016 standard defines an "ROV" as an off-highway vehicle with a minimum top speed of 30 mph, no limit on maximum speed, a maximum engine displacement of 1000 cc, and a maximum Gross Vehicle Weight Rating (GVWR) of 3,750 pounds. The standard specifies requirements for service brakes, parking brakes, and controls specifications for engine, drive train, and steering. Lighting equipment, spark arresters, and warning labels are also covered by the standard.

The ANSI/ROHVA-1-2016 standard has requirements for rollover protective structures (ROPS), lateral stability, vehicle handling, and occupant retention systems that include seat belts and passive restraints.

The ANSI/ROHVA-1-2016 standard does not have requirements for resistance to debris penetration. The vehicles defined by the ANSI/ROHVA 1- 2016 standard are included in staff's definition of ROVs and are intended to be subject to the requirements recommended by CPSC staff.

ANSI/OPEI B71.9-2016 [4]

In March 2012, Outdoor Power Equipment Institute (OPEI) published the ANSI/OPEI B71.9-2012, American National Standard for Multipurpose Off-Highway Utility Vehicles, which is a voluntary standard applicable to ROVs and UTVs.

The most recent edition of OPEI's standard published in 2016, and it provides a definition of "multipurpose off-highway utility vehicles" (MOHUVs) that is very similar to ROHVA's definition of "ROVs." OPEI's definition of "MOHUV" requires a minimum top speed of 25 mph. In addition, OPEI's definition requires a minimum cargo load of 350 pounds and limits GVWR to 4,000 pounds. The standard specifies requirements for service brakes, parking brakes or mechanism, and vehicle controls. Lighting equipment, spark arresters, and warning labels are also covered by the standard. MOHUVs can be ROVs (*i.e.*, vehicles with minimum top speed of 30 mph) or UTVs (*i.e.*, vehicles with top speeds of 25 mph to 30 mph).

The ANSI/OPEI B71.9-2016 standard does not have requirements to guard against the debris penetration risks. The vehicles defined by the ANSI/OPEI B71.9-2016 standard are included in staff's definition of "ROVs" and "UTVs" and are intended to be subject to the requirements recommended by CPSC staff.

Before rulemaking activities, since 2018, CPSC staff met proactively on several occasions with OPEI and ROHVA, to discuss debris penetration hazards associated with ROVs and UTVs. Appendix C contains the details of each meeting.

D. CPSC Contract Work

CPSC staff contracted with SEA Ltd. (SEA), to conduct debris penetration testing with a remotely operated robotic ROV and a simulated ROV mock-up sled that can translate on a linear track [3].

SEA examined incident data and determined that tree branches, generally 1 to 2 inches in diameter, punctured the vehicle floor, particularly in the foot rest/wheel well areas. Occupants experienced chest/abdomen impalements or impalements/lacerations to lower extremities. SEA used a 2-inch diameter oak dowel between 39 inches to 65 inches long for the simulated ROV sled testing, because oak is a hardwood with a relatively high modulus of rupture and modulus of elasticity. A 2-inch diameter oak dowel is a mass-produced item that is readily available. A consistent test component is preferable to reduce test-to-test variability.

SEA initial testing consisted of a remotely operated robotic ROV that was driven into a stationary dowel at 10 mph, as shown in Figure 3. SEA conducted two tests with a remotely operated robotic ROV to examine the particulars of a debris penetration event. SEA determined that a dowel can contact frame members that can influence the trajectory of the dowel and the way the dowel penetrates the floorboard. This would allow the dowel to experience both compressive and bending forces. The bending forces caused the dowel to snap after impact when the robotic ROV was traveling at 10 mph, as shown in Figure 3.

Figure 3 – Multiple Views of the Robotic ROV; Left – Alignment of the Test Dowel with Test Target on the ROV Floorboard; Middle – Front View of Broken Dowel After Collision at 10 mph; Right – Side View of Test Dowel that Entered the ROV Passenger Occupant Area

The second series of testing consisted of a simulated ROV mock-up sled, fitted with OEM floorboards and aftermarket floorboard guards, as shown in Figure 4.

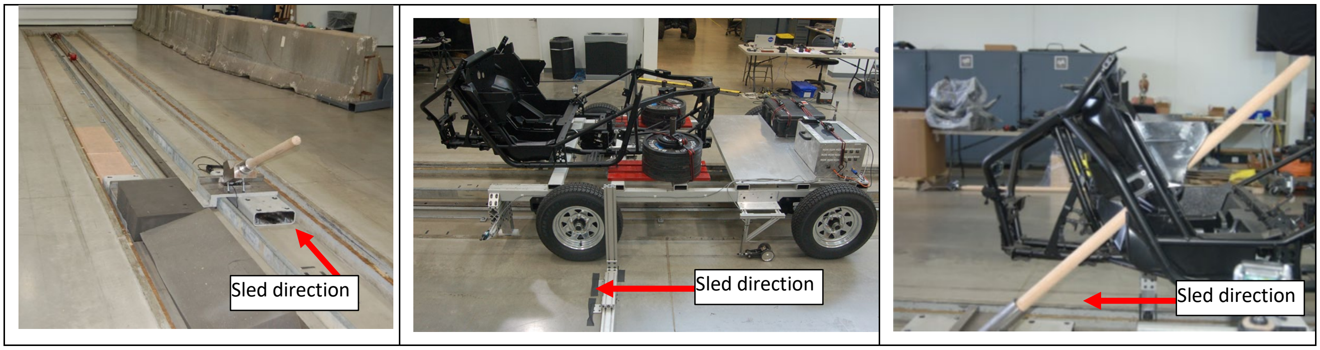

Figure 4 – Multiple Views of the Simulated Vehicle Test Sled; Left – Test Dowel in Relation to the Direction of the Test Sled; Middle – Side View of an Example of a Fully Loaded Test Sled; Right – Side View of a Sled Test where the Test Dowel Penetrated the ROV Floorboard

Both test methods allowed the robotic ROV or the simulated ROV sled to collide with a stationary dowel. The full-scale robotic ROV test showed similar penetration location and puncture characteristics for the sled test (see Figure 5). Both test methods resulted in a dowel penetration through seam area between floorboard and firewall sections. By performing these engineering tests, SEA quantified the speeds and energies required to puncture the floorboards and floorboard guards.

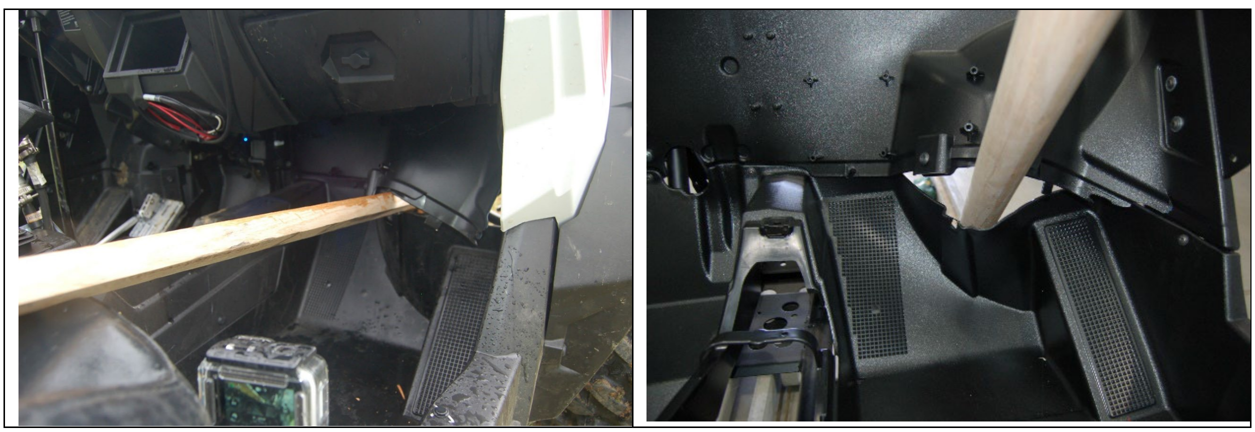

Figure 5 – Comparison of Full-Scale Robotic ROV Test and Sled Test; Left – Robotic ROV Test Where Dowel Penetrated the Seam that Joins the Floorboard and Firewall Panels; Right – Sled Test where the Dowel Penetrated the Seam that Joins the Floorboard and Firewall Panels

Floorboards and aftermarket floorboard guards from five ROV manufacturers were tested using the sled method. SEA conducted a total of 21 test trials. The sled speeds were 2.5, 5, and 10 mph.

The sled tests showed that the stock floorboards for two ROV manufacturers experienced debris penetrations at 2.5 mph. The stock floorboards for all five ROV brands experienced debris penetration at 5 mph. Staff concludes the stock floorboards built by the OEMs offer inadequate protection to the ROV/UTV occupants if debris penetration can occur at speeds as low as 2.5 mph. Figure 6 illustrates a stock floorboard that experience debris penetration at 2.5 mph.

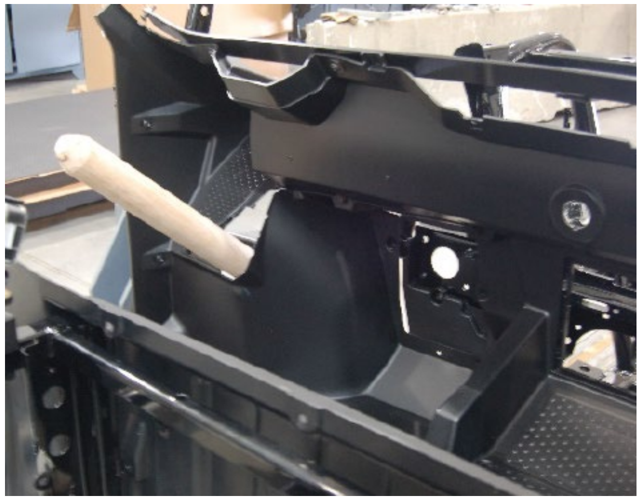

Figure 6 – Interior View, Driver's Side Floorboard Where
Debris Penetration Occurred at 2.5 mph

SEA tested various branded aftermarket metal and plastic floorboard guards to gauge their material strength properties to resist debris penetration. Among the 21 test trials, a metal guard for one brand of ROV did not have debris penetration at 10 mph. Two test trials at 5 mph with metal guards and one test trial with a plastic guard at 5 mph did not have debris penetration. All other test trials with plastic or metal guards failed at 10 or 5 mph.

For tests that did not experience debris penetration, the test dowel was redirected or slid the dowel off to the side or upwards, instead of trying to absorb the high-impact energy. In such cases, the bending forces enabled the dowel to snap off. In some instances, the sled yawed and pitched before the simulated ROV sled came to a complete stop. These actions accomplished the goal of protecting the occupants from the debris penetration hazard. Figure 7 illustrates an aluminum floorboard guard with a black powder coated paint surface that prevented debris penetration at 5 mph. The test sled pitched and yawed, while the tip of the dowel slightly dented, then scraped the floorboard guard's surface and slid to the right before the test sled came to complete stop.

Figure 7 – Illustration of an Aluminum Floorboard Guard that
Redirected the Test Dowel and Prevented Debris Penetration (at 5 mph)

SEA staff procured the aftermarket guards from multiple online vendors. The existence of a market for these guard products suggests there is a need for enhanced protection against debris penetration. Staff is aware of products in the marketplace that can resist debris penetration, and these retrofit products offer additional protection when compared to stock floorboards that can experience debris penetration at speeds as low as 2.5 mph.

SEA concluded:

- If better guards are to be designed, it is likely that they will not work by absorbing energy, but rather, by redirecting the dowel, or breaking it off.
- Guards that worked well in the sled testing tended to work well because they pushed the dowel up and/or to the side. Ideally, they would push the stick all the way to the side of the vehicle and outside the zone of the occupant compartment.
- Testing showed that a successful design for an aftermarket guard or OEM floorboard could involve deflecting the dowel, rather than taking on the force directly. Several of the aftermarket guards were successful at doing this at 5 mph, and one of the guards tested was successful at 10 mph.

Staff observed that the test dowel did not break for a test trial that involved a metal floorboard guard that was sturdy enough to prevent debris penetration at 5 mph. The test dowel deformed the floorboard guard in a scraping manner without puncturing the floorboard guard. Then, the test sled pitched and yawed prior to coming to a full rest. However, the test dowel did break at 10 mph for the same metal floorboard guard, due to the bending forces being greater when the test sled speed was doubled. If a floorboard or floorboard guard is sturdy enough, there will be a greater tendency for the floorboard or floorboard guard to deflect the dowel and increase the dowel's bending forces when the test sled speed is at 10 mph or higher. Thus, a floorboard or floorboard guard that can prevent debris penetration at 10 mph will likely prevent debris penetration at speeds above 10 mph.

Staff's recommended requirements and test procedure are presented in Appendix A. This procedure is based on the SEA test data, the SEA test methods, and the other information discussed in staff's package.

III. STAFF RECOMMENDATION

SEA testing showed that debris penetration can occur at speeds as low as 2.5 mph on standard OEM ROV/UTV floorboards. Staff concludes the current ROV/UTV floorboards are inadequate and offer minimal protection to the occupants. These floorboards do not protect against impalement and/or laceration hazards and the risk of serious injury or death posed by debris penetrations.

To mitigate the debris penetration hazards, staff recommends that all ROVs and UTVs withstand a 10-mph impact with a 2-inch diameter stationary dowel (see draft performance requirement in appendix A). Staff recommends a test procedure that involves propelling a test vehicle or simulated vehicle sled floorboard at 10 mph into a stationary dowel. The proposed test speed of 10 mph was based IDI data analysis, where the majority of the IDIs involved debris penetrations at 10 mph or less. Based on testing of aftermarket floorboard guard by SEA, staff concludes that the proposed performance requirements are feasible.

Appendix A

Technical Description of Test Protocol

1. **Definitions** – Two types of Off-Highway Vehicles (OHVs) are in the scope of the draft Proposed Rule: Recreational Off-Highway Vehicles (ROVs) and Utility Task Vehicles or Utility Terrain Vehicles (UTVs).

A Recreational Off-Highway Vehicle (ROV) is a motorized vehicle designed and intended for off-highway use, with the following features: four or more wheels with tires designed for off-highway use, non-straddle seating for one or more occupants, steering controls, foot controls for throttle and braking, and typically a maximum vehicle speed greater than 30 miles per hour (mph). ROVs are typically equipped with Rollover Protective Structures (ROPS), seat belts, and other restraints, such as doors, nets, and shoulder bolsters for the protection of occupants.

A Utility terrain or utility task vehicle (UTV) is a motorized vehicle designed or intended for off-highway use with the following features: four or more wheels with tires designed for off-highway use, non-straddle seating for one or more occupants, a steering wheel for steering controls, foot controls for throttle and braking, and a maximum vehicle speed typically between 25 and 30 mph. UTVs are typically equipped with Rollover Protective Structures (ROPS), seat belts, and other restraints, such as doors, nets, and shoulder bolsters for the protection of occupants.

2. **Acceptance Limits and Requirements** – Upon testing to the test procedure described below, the test ROV/UTV floorboard and/or floorboard guard shall not allow any breach of the test dowel into the occupant area, although deformations and/or deflections of the floorboard and/or floorboard guard are allowable. Examples of breach include cracks, holes, tears, seam gaps, or any other openings that allow any part of the test dowel to enter the occupant area. .

3. **Load Condition** – The required load condition for a two-seat model is 430 lbs, representing a driver and a front seat passenger, each equivalent to a 95th percentile male (215 lbs). For four-seat models, the load condition shall be 860 lbs, representing the driver and three passengers. For six-seat models, the load condition shall be 1290 lbs, representing the driver and five passengers. Typical gross vehicle weights of fully loaded test vehicles or simulated vehicle sleds exceed 2000 lbs.

4. **Test Vehicle or Simulated Vehicle Sled Conditions** – The fully loaded test vehicle shall be fitted with the test floorboard and/or floorboard guard(s), as offered for sale. If a simulated vehicle sled will be used, where a ROV/UTV front metal frame is fitted with the test floorboard and/or floorboard guard(s), the simulated vehicle sled must be able to translate on a linear track that can propel the simulated vehicle sled to at least 10 mph.

5. **Test Speed** – Test Vehicle or simulated vehicle sled speed, in miles per hour (mph) shall be measured at the moment of impact. The vehicle speed or simulated vehicle sled speed at the moment of impact shall be at least 10 mph.

6. Test Location: The test dowel shall be positioned in such a way that the test dowel will strike the wheel-well area. The target of the test dowel cannot be any component other than the floorboard or floorboard guard surface. The target shall be at the point on the floorboard or floorboard guard most likely to produce the most adverse results, such as a seam, crease, catch point, or bend.

7. **Test Equipment** – A 2-inch diameter oak dowel positioned at angle between 12° to 25° from horizontal (indicated as X° in Figure 8) shall be installed on a dowel holder that can pivot about its transverse axis. The length of the dowel shall be between 39 inches to 65 inches. The tip of dowel shall be tapered, such that the tip surface diameter is 1 inch, and the tip cone length is 1 inch. A range of angles and a range of dowel lengths are necessary, due to the various shapes, depths, contours, suspension component arrangements, and control arm dimensions of all the ROV/UTV wheel well configurations. See Figure 9. The dowel holder shall be constructed of a rigid material, such that the dowel holder does not fracture during the impact test. To minimize damage to test equipment, a vehicle or simulated vehicle sled braking system and/or energy absorption foam blocks located 2 feet past the debris penetrator dowel holder is recommended. The braking system shall only activate after the vehicle or simulated vehicle sled collides completely with the debris penetrator dowel.

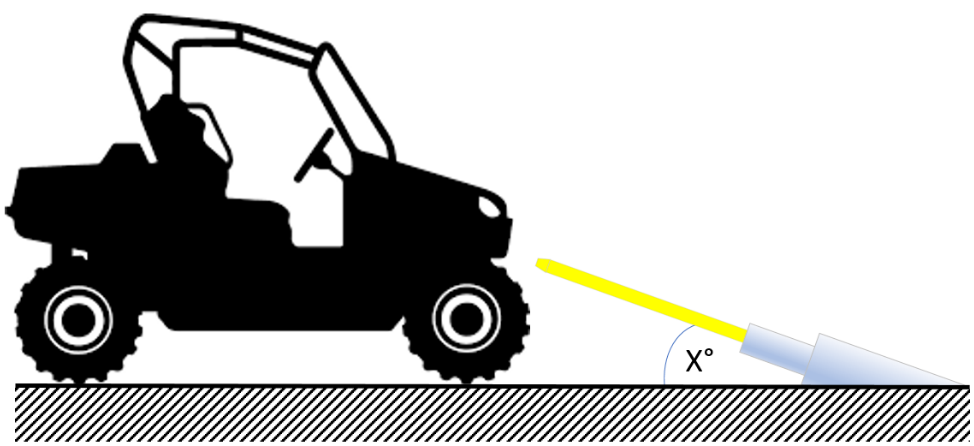

Figure 8 – Illustration of Debris Penetrator Test Dowel Orientation

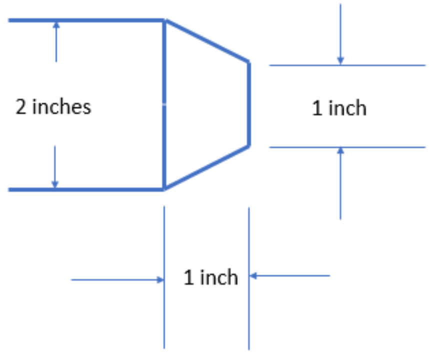

Figure 9 – Illustration of Debris Penetrator Test Dowel Tip Taper

8. **Test Conditions** – If a test vehicle is used, the test surface must be dry asphalt or dry concrete that is free of contaminants. Sufficient track length shall be available to allow the test vehicle or simulated vehicle sled to reach 10 mph. The test surface must be flat and have a grade slope of 1.7% (1°) or less. Ambient temperature shall be greater than 0°C (32°F).

9. **Test Procedure** – The debris penetrator test dowel shall be aligned with the target site of the floorboard or floorboard guard. A fully loaded, fully instrumented test vehicle or simulated vehicle sled shall be propelled in a straight-line path to collide with the debris penetrator test dowel, where the test vehicle or simulated vehicle sled speed shall be at least 10 mph at the moment of impact. For each vehicle model, a minimum of two test trials of one chosen test method shall be conducted.

10. **Rationale –Test Conditions**: The required ambient temperature of 0°C (32°F) or greater, maximum allowable flat course slope grade of 1.7% (1°) or less, flat dry asphalt or dry concrete conditions, and the 95th percentile male weight are consistent with the lateral stability requirements of ANSI/OPEI B71.9-2016 and ANSI/ROHVA-1-2016. These conditions simulate real use and allow for repeatable test results.

Appendix B

List of Voluntary Standards Activities with OPEI and ROHVA

Date	Event
September 19, 2018	Voluntary Standards - Meeting with ROHVA, SVIA, and OPEI to discuss Off-Highway Vehicle Fire and Debris Penetration Hazards Meeting Log
June 27, 2019	Meeting with ROHVA, SVIA, and OPEI at the SEA facility in Ohio, to discuss Off-Highway Vehicle Fire Hazard In-Depth Investigation Categorization Meeting Log
July 24, 2019	Public Commission Briefing - Off-Highway Vehicle Fire and Debris Penetration Hazards Video of the Meeting
October 1, 2019	Voluntary Standards – Letter to Off-Highway Vehicle Standard Development Organizations ROHVA, SVIA, and OPEI regarding Categorization of Fire Hazard In-Depth Investigations Voluntary Standards Letter
December 9, 2019	Voluntary Standards - Meeting with ROHVA, SVIA, and OPEI to discuss Off-Highway Vehicle Fire and Debris Penetration Hazards Meeting Log
March 25, 2020	Voluntary Standards – Letter to Off-Highway Vehicle Standard Development Organizations ROHVA, SVIA, and OPEI regarding Categorization of Fire Hazard In-Depth Investigations Voluntary Standards Letter
July 28, 2020	Voluntary Standards - Letter to Off-Highway Vehicle Standard Development Organizations ROHVA, SVIA, and OPEI regarding the schedule of the next meeting and agenda topics
September 9, 2020	Voluntary Standards – Virtual meeting with ROHVA, SVIA, and OPEI to discuss possible standards requirements to address Off-Highway Vehicle Fire Hazards Meeting Log
May 11, 2021	Advance Notice of Proposed Rulemaking (ANPR) for Off-Highway Vehicle Fire and Debris Penetration Hazards Federal Register, Volume 86, Number 89, Tuesday, May 11, 2021, Proposed Rules. Briefing Package
November 9, 2021	Voluntary Standards Meeting - Meeting with ROHVA, SVIA, and OPEI to discuss possible standard requirements to address Off-Highway Vehicle Fire and Debris Penetration Hazards

Appendix C
List of References

	Author	Title	Publisher	Year
1	CPSC Staff	*Notice of Proposed Rulemaking for Recreational Off-Highway Vehicles (ROVs)* Website URL: https://www.govinfo.gov/content/pkg/FR-2014-11-19/pdf/2014-26500.pdf	Federal Register	2014
2	CPSC Staff	*Advance Notice of Proposed Rulemaking for Off-Highway Vehicle (OHV) Fire and Debris Penetration Hazards* Website URL: https://www.govinfo.gov/content/pkg/FR-2021-05-11/pdf/2021-09881.pdf	Federal Register	2021
3	Heydinger, Gary J., et al.	*Study of Debris Penetration of Recreational Off-Highway Vehicle (ROV) Floorboards* Website URL: https://www.cpsc.gov/content/Study-of-Debris-Penetration-of-Recreational-Off-Highway-Vehicle-ROV-Floorboards	CPSC.GOV	2021
4	OPEI	*ANSI/OPEI B71.9-2016, American National Standard for Multipurpose Off-Highway Utility Vehicles*	OPEI	2016
5	ROHVA	*ANSI/ROHVA 1 – 2016, American National Standard for Recreational Off-Highway Vehicles*	ROHVA	2016

TAB B

Preliminary Regulatory Analysis of the Draft Proposed Rule for Mitigating the Debris Penetration Hazards Associated with Recreational Off-Highway Vehicles (ROVs) and Utility Task/Terrain Vehicles (UTVs)

Rodney Row
Directorate for Economic Analysis
U.S. Consumer Product Safety Commission
April 6, 2022

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EXECUTIVE SUMMARY

The U.S. Consumer Product Safety Commission (CPSC, or Commission) is considering a draft proposed rule for recreational off-highway vehicles (ROVs) and utility task/terrain vehicles (UTVs). The risk of tree branches puncturing floorboards and impaling occupants in ROVs and UTVs is present when these vehicles are driven in tree-branch environments. The existing voluntary standards for ROVs and UTVs do not address floorboard debris penetration. The draft proposed rule addresses the hazard from debris penetration by establishing a performance requirement that no debris penetration occur in an occupant area when propelling a ROV or UTV test vehicle or simulated test vehicle floorboard at 10 miles per hour (mph) to strike a stationary oak dowel.

Information from CPSC's National Electronic Injury Surveillance System (NEISS) and the Consumer Product Safety Risk Management System (CPSRMS) shows that there was an annual average of at least 0.50 deaths and 1.83 medically attended injuries to ROV and UTV occupants from debris penetration incidents over the period from 2009 to 2021.

CPSA section 9(c) provides that a description of potential benefits and costs should be included in a preliminary regulatory analysis. This preliminary regulatory analysis estimated benefits (section 3) and costs (section 4) and presented both as an annualized and per-vehicle basis, and as a present value using an annual discount rate of 3 percent.

This analysis estimated benefits from the draft proposed rule, by subtracting the expected societal costs (*i.e.*, deaths and injuries from floorboard debris penetration) during rule implementation, from the expected societal costs in the absence of the rule. The difference is the avoided deaths and injuries attributed to the implementation of the draft proposed rule. This analysis estimated potential benefits from the draft proposed rule to be $15.47 million on annualized basis and $12.07 on a per-vehicle basis.

In assessing costs, staff considered two types of solutions to the debris penetration hazard under the draft proposed rule: (i) a fully redesigned floorboard that uses most of the material in original floorboards, and (ii) floorboards with floorboard guards. The analysis estimated the annualized costs to be $9.26 million for the fully redesigned floorboard solution and $15.53 million for the floorboard guard solution. The per-vehicle cost is $7.23 and $12.13 for the redesigned floorboard and floorboard guard solutions, respectively.

Staff compared estimated benefits and costs to assess the net benefits of the draft proposed rule and the relation between benefits and costs. The benefits meet or exceed the cost of the draft proposed rule. The ratio of benefits to costs is between 1.00 and 1.67.

1 Introduction

The CPSC is considering a draft proposed rule to establish a mandatory performance requirement and test procedure to reduce the risk of debris penetration for ROVs and UTVs. ROVs and UTVs are off-highway vehicles (OHVs) that consumers drive for utility and entertainment. However, the risk of tree branches puncturing floorboards and impaling occupants is present when these vehicles are being driven in tree-branch environments. CPSC's draft proposed rule would establish a performance requirement that no debris penetration occurs in the occupant area when propelling a test vehicle or simulated test vehicle at 10 mph to strike a stationary dowel. Staff assesses this test would result in ROV and UTV manufacturers substantially improving the structural integrity of the floorboards in these vehicles, which would reduce the likelihood of impalement and/or lacerations from debris penetration.

The Commission initiated this rulemaking proceeding on May 11, 2021, with the publication of an advance notice of proposed rulemaking (ANPR)[1] in the *Federal Register*. This document is a preliminary regulatory analysis for the notice of proposed rulemaking (NPR). This document includes a description of the performance requirement and test procedure and its impact to industry, the societal benefits associated with this rulemaking, the societal and market costs of promulgating this rule, and the current voluntary standards that address the debris penetration hazard for ROVs and UTVs.

1.1 Proposed Rule

The draft proposed rule would establish a mandatory performance standard that all ROVs and UTVs must meet to be sold in the United States. Staff describes in detail the requirements and test procedure of the draft proposed standard in Tab A.

1.2 Preliminary Regulatory Analysis

Pursuant to section 9(c) of the Consumer Product Safety Act, publication of a proposed rule must include a preliminary regulatory analysis containing:

(1) A preliminary description of the potential benefits and potential costs of the draft proposed rule, including any benefits or costs that cannot be quantified in monetary terms, and an identification of those likely to receive the benefits and bear the costs. A preliminary description of the potential benefits and costs of the draft proposed rule is included in Sections 3

1 Federal Register, Vol. 86, No. 25817, May 11, 2021, 25817-25830.

and 4 of this Tab. Section 5 describes the potential net benefits (*i.e*., potential benefits minus potential costs).

(2) A discussion of the reasons why a standard submitted to the Commission in response to the ANPR was not published as the draft proposed rule. No standard was submitted during the ANPR comment period, and thus, no standard was available for the Commission to consider.

(3) A discussion of why a relevant voluntary safety standard would not eliminate or adequately reduce the risk of injury addressed by the proposed rule. Section 6 of this Tab contains a discussion of the voluntary standards.

(4) A description of any reasonable alternatives to the proposed rule, together with a summary description of their potential costs and benefits and why such alternatives should not be published as a proposed rule. Section 7 of this Tab discusses the regulatory alternatives.

The primary focus of this preliminary regulatory analysis is staff's preliminary assessment of potential benefits (section 3) and costs (section 4) from this draft proposed rule. Staff estimates benefits by subtracting the expected societal costs (*i.e*., deaths and injuries from floorboard debris penetration), assuming the rule has been implemented from the expected societal costs in the absence of the rule (or baseline scenario). Estimated costs include costs to industry from implementing a ROV/UTV fix that addresses the debris penetration hazard, the costs associated with government oversight and compliance monitoring (considered negligible), and the deadweight losses that are the measured impacts to consumers and producers displaced from the ROV/UTV market because of a potential price increase. Staff estimated benefits and costs over a 30-year period that starts in 2024, which is the year that staff assumes the rule will go into effect. A 30-year period allows for several cycles of useful life for ROVs and UTVs and ensures the assessment accounts for the long-term effects of the draft proposed rule. Staff presents all estimates in 2021 dollars. To account for the time value of money, staff applied an annual 3 percent discount rate to forecasted benefits and costs.

2 Market Information

ROVs and UTVs comprise two of the three OHV categories discussed in the ANPR. The third category, ATVs, is not subject to this NPR because ATVs have seating that straddles the engine and transmission, which provides protection from debris penetration. Staff also excluded ROVs and UTVs marketed towards children because of these vehicles' low ground clearances and wheel-well configurations, as well as the lack of incident data involving these vehicles.

Staff defines an "ROV" as a motorized vehicle with four or more pneumatic tires designed for off-highway use, bench or bucket seats for two or more occupants, automotive-type controls for steering, throttle, and braking, and a maximum vehicle speed greater than 30 mph.

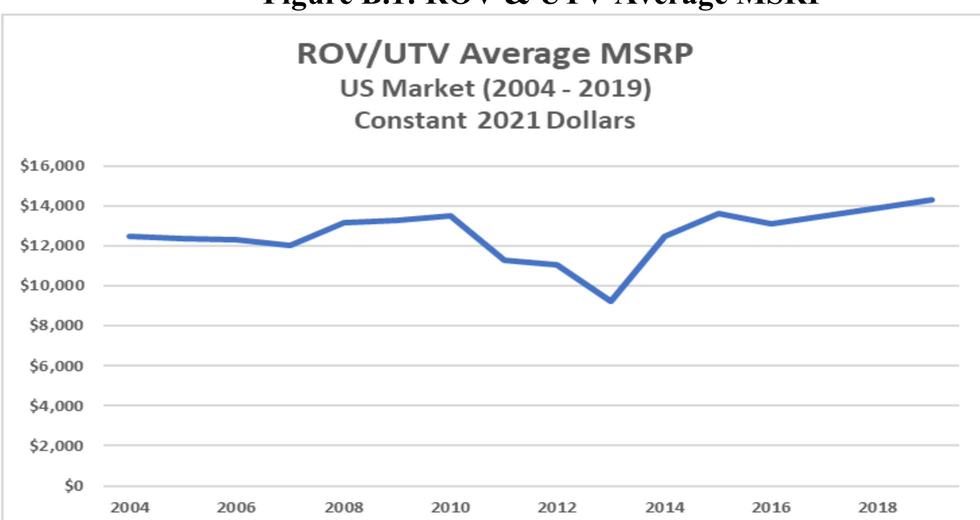
Staff defines a "UTV" as a motorized vehicle designed for off-highway use with four or more pneumatic tires designed for off-highway use, bench or bucket seats for two or more occupants, automotive-type controls for steering, throttle, and braking, and a maximum speed generally between 25 and 30 mph. UTVs generally have larger cargo beds than ROVs.

ROVs and UTVs exhibit significant variation in design, weight, engine displacement, cargo capacity, and other characteristics and accessories among models.

2.1 Retail Prices

In 2019, ROV and UTV manufacturer's suggested retail prices (MSRP) ranged from a minimum of $4,599 to a maximum of $53,700. When weighted by sales volume, the mean MSRP is $13,182 for ROVs and UTVs,[2] which, in 2021 dollars, equates to $14,302. As shown in Figure B.1, before 2013, the average ROV and UTV MSRP showed a downward trend. However, beginning in 2013, the average ROV and UTV MSRPs have increased steadily. This trend appears to be driven by increasing sales of more expensive models with higher maximum MSRPs. Figure B.1 displays MSRPs for ROVs and UTVs from 2004 through 2019 in constant 2021 dollars.

Figure B.1: ROV & UTV Average MSRP

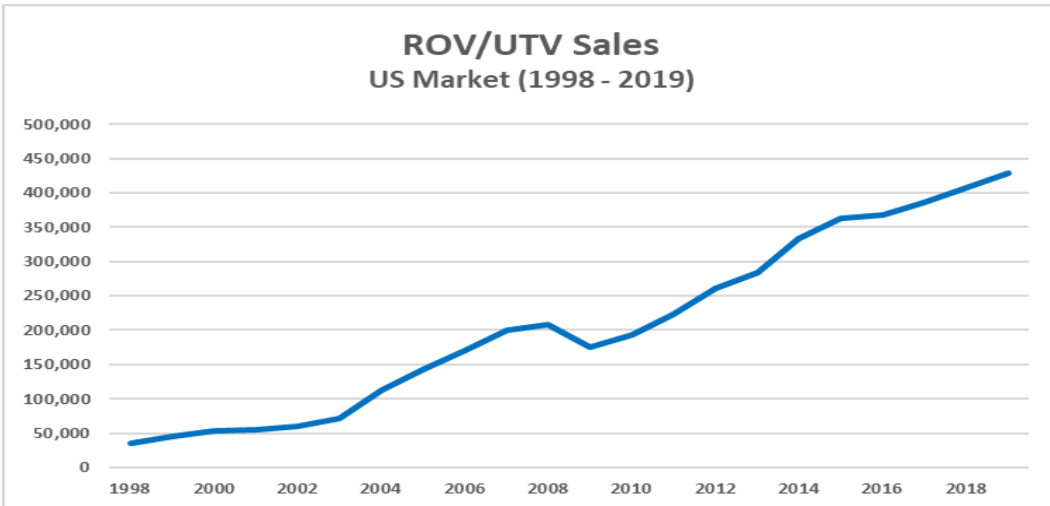


2 Unless otherwise noted, the ROV/UTV product and market information is based on staff analysis of 1998–2019 sales data provided by Power Products Marketing, Eden Prairie, MN (2020).

2.2 Annual Sales and Shipments

Except for 2009, annual sales of ROVs and UTVs in the United States have increased steadily, from an estimated 35,041 units in 1998, to 429,135 units in 2019.[3] Figure B.2 illustrates combined ROV and UTV unit sales from 1998 through 2018.

Figure B2: Unit Sales of ROV/UTVs from 1998 to 2018



Staff identified 35 manufacturers known to have supplied ROVs and UTVs to the U.S. market in 2019: 17 from the United States, 14 from China (including Taiwan), and one each from Canada, Mexico, South Korea, and Spain. Additionally, there are 48 distributers/brands.[4] Staff estimated U.S. manufacturers accounted for approximately 83 percent of U.S. ROV and UTV sales in 2019, and that current members of the Recreational Off-highway Vehicle Association (ROHVA) and/or the Outdoor Power Equipment Institute (OPEI) accounted for approximately 95 percent of U.S. ROV and UTV sales in 2019. Figure B.3 illustrates the market share for U.S. manufacturers and ROHV/OPEI members between 1998 and 2019.

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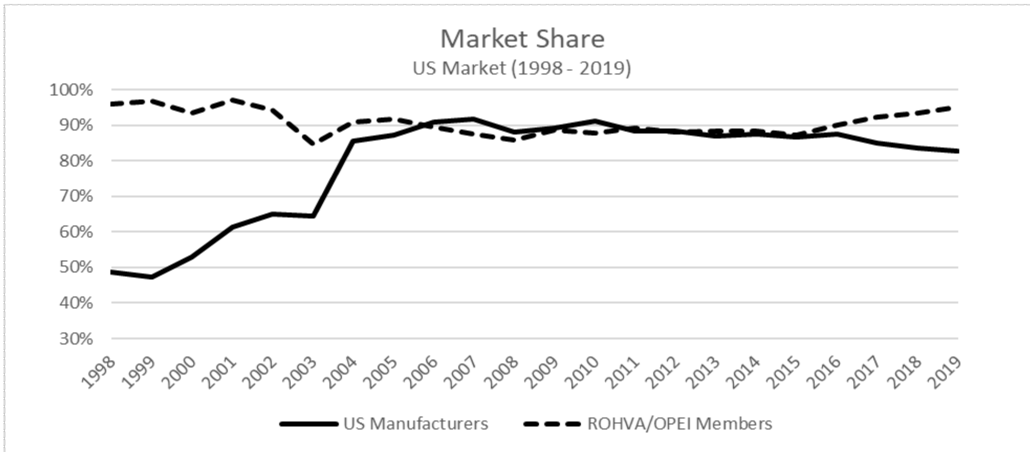
[3] CPSC staff generated U.S. sales estimates for years 1998 to 2008 by multiplying North American sales for those years by an estimate of the U.S. market share for years 2009 through 2019.

[4] Many ROV and UTV manufacturers are also distributers and produce vehicles for more than one distributer and/or brand.

Figure B.3: Market Share of U.S. Manufacturers and ROHV/OPEI Members



Staff identified 461 different ROV and UTV model variants and configurations sold in the United States in 2019. Excluding variants and configurations that appear to be based on a common base model, staff estimated that there may be as few as 107 unique models introduced in 2019 and estimated a total of 672 models in use by consumers.

2.3 Estimated ROV and UTV Units in Use

Staff estimated there were 2.34 million[5] ROVs and UTVs in use in the United States in 2019. Staff developed this estimate based on the number of sales of ROV and UTV in prior years, and then designated a product life (in years) to each unit sold. The distribution of product life years for ROVs and UTVs informs the analysis of what proportion of units will last above or below its average product life. For example, the average product life for an ROV/UTV is 6 years. Therefore, a plurality of ROVs/UTVs will be in use for 6 years, but some ROVs/UTVs will be in use less than the expected 6 years, while others will be in use longer than 6 years. The distribution of product life informs this analysis of what proportion of sold units will fall into each amount (in years) of product life. This process helps assess how many ROVs/UTVs are still in use, given any number of years after they are sold.

[5] A two-parameter gamma distribution was used to forecast ROV and UTV survival rates with shape parameter of 6 and scale parameter of 1, which are consistent with a mean product life of 6 years.

3 Preliminary Regulatory Analysis: Benefits Assessment

This section presents the potential benefits associated with implementing the performance requirement from the draft proposed rule for mitigating debris penetration hazards associated with ROVs and UTVs.

3.1 Benefits Assessment Methodology

Staff conducted the preliminary regulatory analysis from a societal perspective that considers significant costs and health outcomes (Russell, Gold, et al., 1996; Haddix, Teutsch, and Corso, 2003; Neumann et al, 2016). Staff captured expected reduction in societal costs by estimating the number of deaths and injuries from debris penetration that would be prevented by the draft proposed rule. The Directorate for Epidemiology (EP) retrieved casualties reported through the National Electronic Injury Surveillance System (NEISS), a national probability sample of U.S. hospital emergency departments (ED), and the Consumer Product Safety Risk Management System (CPSRMS), a database of consumer incident reports. Staff then forecasted the number of expected reported deaths and injuries for a 30-year study period and converted the value of prevented deaths and injuries into monetary terms using the Value of Statistical Life (VSL) for deaths and CPSC's Injury Cost Model (ICM) for injuries.

Staff used a 30-year study period to assess the benefits of the draft proposed rule. Staff assumed, for the purpose of this analysis, that the rule would go into effect at the beginning of 2024; this results in a study period of 2024 through 2053. A 30-year period allows for several cycles of useful life for ROVs and UTVs and ensures the benefits assessment accounts for all long-term effects from the draft proposed rule. Staff then converted the aggregate benefits over the 30-year study period into annualized and "per-product" outputs. An annualized output converts the aggregate benefits over 30 years into a consistent annual amount while considering the time value of money. This metric is helpful when comparing the benefits among different rules or policy alternatives that may have different timelines; or those that have similar timelines, but benefits for one are front-loaded, while the other's benefits have a latent effect.[6] A per-product metric expresses the benefits from the rule in one unit of product. This metric is helpful when assessing the impact in marginal terms; for example, comparing benefits to an increase in retail price or marginal increase in cost of production per-unit. Staff presents both these metrics to convey a holistic perspective of the impact from this draft proposed rule.

[6] The timing of benefits, along the period of study, affect the present value of benefits when considering the time value of money. Benefits realized several years into the future are discounted more heavily than benefits realized in the short term.

3.2 Deaths and Injuries Over the 30-Year Study Period

Staff identified six deaths and 22 nonfatal injuries that occurred from 2009 through 2021, related to debris penetration incidents involving occupants. Of the 22 nonfatal injuries, four required hospital admission, three resulted in ED treatment, two were treated and released, or released without treatment, one received first aid by a non-medical professional, and two received no treatment. The level of care provided for the remaining 10 incidents is not known. Staff gathered these casualties from NEISS (three nonfatal incidents) and CPSRMS (the remaining incidents) and confirmed there was no overlap.

Next, staff used the incident data on debris penetration from NEISS and CPSRMS to forecast the number of injuries from debris penetration treated in ED and other settings throughout the 30-year study period. Typically, staff would use reported injuries from NEISS, which only records injuries from a sample of U.S. hospitals, and then staff would extrapolate the data into a national estimate. However, the number of recorded incidents of debris penetration from the sample hospitals was lower than the publication criteria established in NEISS. Therefore, staff could not develop a national estimate and had to estimate the benefits using a forecast of reported injuries from the sample hospitals only. There are likely many more unreported incidents outside of the sample hospitals not accounted for in this analysis, and thus, staff's estimated benefits are likely an underestimate.

To forecast into the future deaths and injuries from debris penetration, staff used death and injury rates per million ROVs/UTVs with its forecast of "ROVs/UTVs in use" throughout the 30-year study period. Staff assumed deaths and injuries would stay the same as the average rates observed between 2010 to 2019[7] in the NEISS and CPSRMS databases: 0.36 deaths, 0.24 hospital admissions, 0.24 emergency department admissions, and 0.72 doctor/clinic visits per million ROVs/UTVs in use.

Staff forecasted ROVs/UTVs in use using exponential smoothing. Staff then multiplied the number of ROVs/UTVs in use in each year of the study period by the rates of deaths and injuries, to estimate the total number of deaths and injuries for each year of the 30-year study period. Figure B.4 displays the estimated number of incidents for each death and injury category from 2010 through 2053 in the baseline scenario, which assumes the draft proposed rule does not go into effect.

[7] Staff based its estimated injury rates on the incident data from the window 2010-2019. This window represents a typical ten-year timeframe for data analysis and was the most robust recent data that was continuous. Because of ongoing reporting, data from the latest years 2020 and 2021 are considered incomplete and were thus not used in the analysis.

Figure B.4: Number of Injuries and Deaths from ROV/UTV Debris Penetration

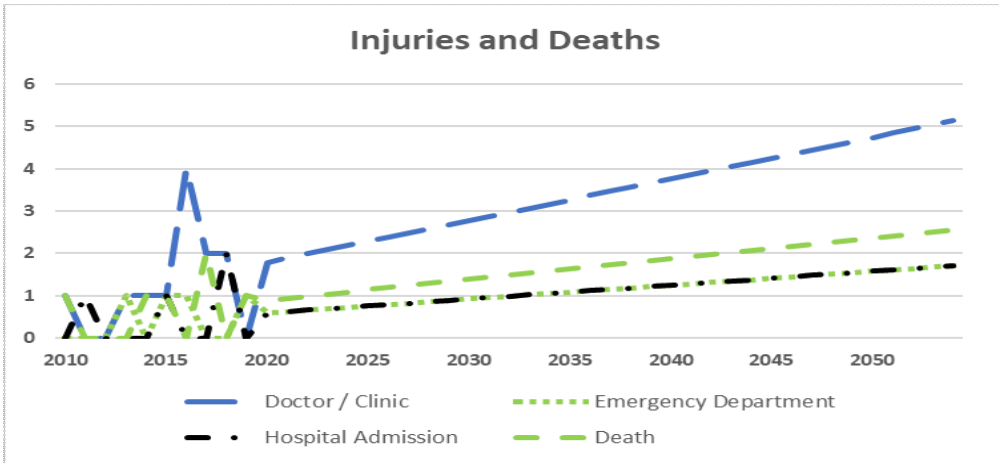


Figure B.4 illustrates that most injuries are treated in a doctor's office/clinic. In the year 2053, estimated injuries treated at a doctor's office/clinic reaches 5 per year, injuries treated at the ED and those admitted to the hospital largely overlap over the analysis period and reach 1.7 in both cases in 2053, and the estimated number of deaths reaches 2.5 in 2053. In the same year, staff estimated the number of ROVs and UTVs in use to reach 6.98 million, or about three times the number in use in 2019.

3.3 Societal Costs of Deaths and Injuries Over the 30-Year Study Period

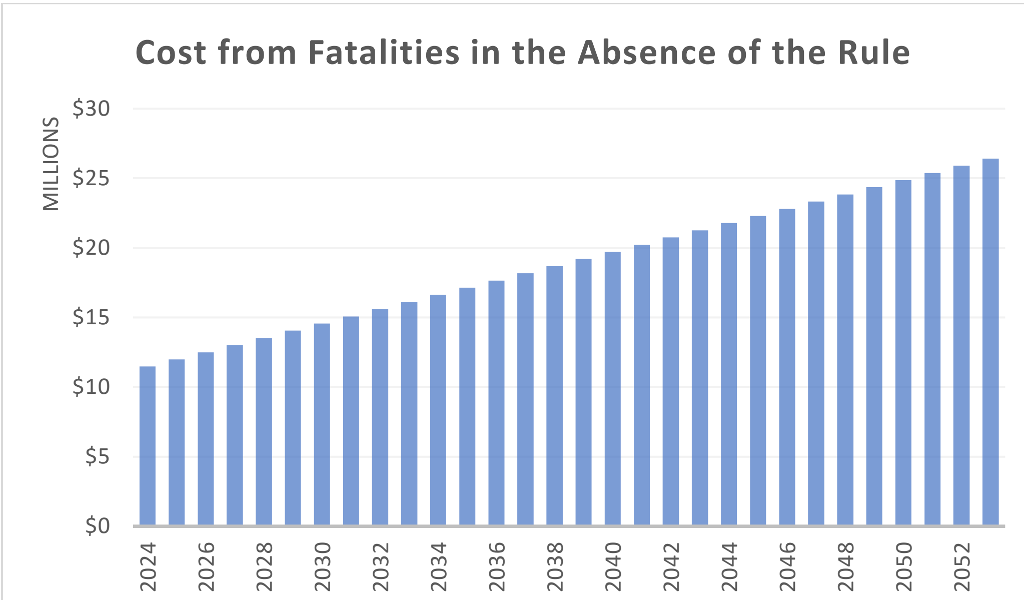
This section presents the methodology to monetize the costs from deaths and injuries from debris penetration in the absence of the rule and determines how much those societal costs would be avoided if CPSC promulgated the draft proposed rule.

3.3.1 Societal Cost from Deaths

To estimate the societal costs of debris penetration-related deaths, staff applied the VSL. VSL is an estimate used in benefit-cost analysis to place a value on reductions in the likelihood of premature deaths (OMB, 2003). The VSL does not place a value on individual lives, but rather, it represents an extrapolated estimate based on the rate at which individuals trade money for small changes in mortality risk (OMB, 2003). This is a "willingness to pay" methodology that attempts to measure how much individuals are willing to pay for a small reduction in their own mortality risks, or how much additional compensation they would require to accept slightly higher mortality risks. For this analysis, staff applied a VSL developed by the U.S. Environmental

Protection Agency (EPA). The EPA VSL, when adjusted for inflation, is $10.5 million [8]in 2021 dollars. Staff multiplied the VSL by the number of forecasted deaths throughout the study period to calculate societal cost of deaths from debris penetration in absence of the draft proposed rule. Figure B.5 displays these costs throughout the study period.

Figure B.5: Cost from Fatalities



According to Figure B.5, in the first year of the study period (2024), costs from death are $11.47 million and grow to $26.42 million in 2053. Over 30 years, the societal costs from deaths due to debris penetration aggregate to $568.3 million, according to staff estimates.

3.3.2 Societal Cost from Injuries

Staff estimated the societal costs of nonfatal injuries from debris penetration using the ICM. The provides estimates of the societal costs of medically treated injuries. The societal cost components provided by the ICM include medical costs, work losses, and the intangible costs associated with pain and suffering (Lawrence et al., 2018).

Medical costs include three categories of expenditures: (1) medical and hospital costs associated with treating the injured victim during the initial recovery period and in the long run, including the costs associated with corrective surgery, the treatment of chronic injuries, and rehabilitation

[8] In 2008, the EPA estimated the value of a statistical life at $7.9 million. CPSC staff adjusted this estimate for inflation to the end of 2021, using the Consumer Price Index for All Urban Consumers (CPI-U) estimated the Bureau of Labor Statistics and rounded it to the nearest hundred thousand. The adjustment is as follows: $7.9M x (278.802/210.228) = $10.477M, which is then rounded to $10.5M.

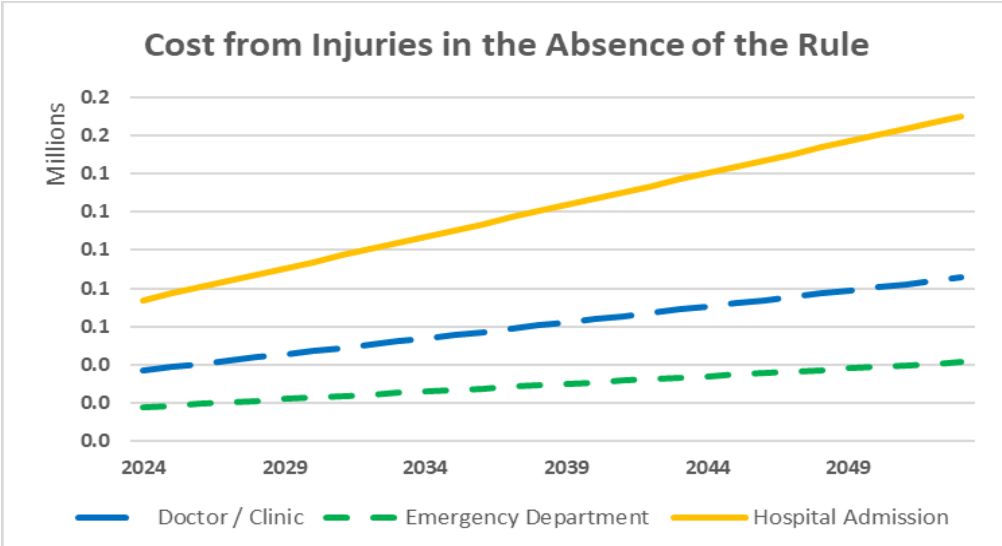
services; (2) ancillary costs, such as costs for prescriptions, medical equipment, and ambulance transport; and (3) costs of health insurance claims processing. The ICM derives cost estimates for these expenditure categories from several national and state databases, including the Medical Expenditure Panel Survey (MEPS), the Nationwide Inpatient Sample of the Healthcare Cost and Utilization Project (HCUP-NIS), the Nationwide Emergency Department Sample (NEDS), the National Nursing Home Survey (NNHS), MarketScan® claims data, and a variety of other federal, state, and private databases.

Work loss estimates include: (1) the forgone earnings of the victim, including lost wage work and household work; (2) the forgone earnings of parents and visitors, including lost wage work and household work; (3) imputed long-term work losses of the victim that would be associated with permanent impairment; and (4) employer productivity losses, such as the costs incurred when employers spend time rearranging schedules or training replacement workers. The ICM bases these estimates on information from the MEPS, the Detailed Claim Information (a workers' compensation database) maintained by the National Council on Compensation Insurance, the National Health Interview Survey, the U.S. Bureau of Labor Statistics, and other sources.

The intangible costs of injury reflect the physical and emotional trauma of injury, as well as the mental anguish of victims and caregivers. Intangible costs are difficult to quantify because they do not represent products or resources traded in the marketplace. Nevertheless, they typically represent the largest component of injury cost and need to be accounted for in any benefit-cost analysis involving health outcomes (Rice et al., 1989; Haddix, Teutsch, and Corso, 2003; Cohen and Miller, 2003; Neumann et al, 2016). The ICM develops monetary estimates of these intangible costs from jury awards for pain and suffering. Although these awards can vary widely on a case-by-case basis, studies have shown these are systematically related to several factors, including economic losses, the type and severity of injury, and the age of the victim (Viscusi, 1988; Rodgers, 1993; Cohen and Miller, 2003). The ICM derives these estimates from a regression analysis of jury awards in nonfatal product liability cases involving consumer products compiled by Jury Verdicts Research, Inc.

The ICM estimated that the costs (in 2021 dollars) associated with nonfatal debris penetration injuries are: $17,013 for injuries treated at the doctor's office/clinic, $24,694 for injuries treated at the emergency department, and $101,433 for injuries that result in hospital admission. Staff multiplied these estimates by the number of forecasted incidents in Figure B.4 to estimate societal cost from injuries through 2053. Figure B.6 shows the forecasted societal costs from injuries in the absence of the rule through 2053.

Figure B.6: Cost of Injuries



According to the chart, society would incur a cost in the first year of the study period (2024) of $0.04 million for injuries treated at a doctor's office/clinics, $0.02 million for those treated at EDs, and $0.07 million for injuries resulting in hospital admissions. These costs grow to $0.09 million for doctor's office/clinic, $0.04 million for ED, and $0.17 million for hospital admissions in 2053. Over 30 years, staff estimated the societal costs from injuries due to debris penetration aggregate to $1.85 million for doctor's office/clinic, $0.89 million for ED, and $3.66 million for hospital admissions. The total cost for all injuries reaches $6.39 million over the 30-year study period.

3.3.3 Benefits from the Draft Proposed Rule

The total estimated societal cost of deaths and injuries in the absence of the draft proposed rule would be $574.69 million over the study period (2024-2053). However, the requirements in the draft proposed rule are not expected to mitigate all the deaths and injuries from debris penetration. Based on laboratory tests, staff estimates that approximately 95 percent of all incidents would be avoided because upon implementing the proposed rule. Staff assesses that implementing the performance requirement would prevent all debris penetration incidents that occur when the vehicle is travelling 10 mph or below, and most incidents travelling above 10 mph.

Additionally, in the initial years after the implementation of the proposed rule, some noncompliant ROVs and UTVs will still be in use. To account for this, staff estimated the percentage of noncompliant ROVs/UTVs in each year during the 30-year study period. For instance, in the first year of the study period (2024), staff estimated that only 17.6 percent of

ROVs/UTVs in use would be compliant, and only 16.7 percent[9] of the $11.6 million in societal costs would be avoided because of the draft proposed rule, which equates to $1.94 million[10]. Staff estimates the compliance rate of ROVs/UTVs in use increases to 84.4 percent by 2029 (*i.e.*, 6 years from the implementation of the rule), and it approaches 100 percent by 2035. After this adjustment, staff estimated that from 2024 through 2053, an aggregate $537.29 million in societal costs would be avoided if the CPSC promulgated the draft proposed rule.

3.4 Annualized and Per-Vehicle, In-Use Benefits of the Draft Proposed Rule

Staff then converted the aggregate benefits over the 30-year period of study into annualized and "per-product" metrics. An annualized metric converts the aggregate benefits over 30 years into a consistent annual amount while considering the time value of money. This metric is helpful when comparing the benefits among different rules or policy alternatives that may have different timelines; or that have similar timelines, but the benefits may be skewed differently (*i.e.*, front-loaded vs. back-loaded). Per-product metrics express the benefits from the rule in one unit of product. This metric is helpful when assessing the impact in marginal terms (*e.g.*, comparing benefits to an increase in retail price or marginal increase in cost of production per-unit).

The undiscounted average annual benefits are $17.02 million. To calculate present value, staff discounted the annual benefits in each year of the 30-year period using a compounding 3 percent discount rate. The annualized benefits, at a 3 percent discount rate, are $15.47 million. To estimate the benefit per product, staff divided the annualized benefits (undiscounted and discounted) by the average number of compliant vehicles to calculate the benefits per-product. Using this methodology, staff estimated the benefits from the draft proposed rule per ROV or UTV in use to be $20.32 per vehicle undiscounted and $12.07 per vehicle discounted at 3 percent.

Table B.7 presents the findings from this benefits assessment from both the annualized and per-product perspectives.

Table B.7: Total and Per-Product Benefits, Undiscounted and Discounted at 3

Benefits	Undiscounted	Present Value (Discounted at 3%)
Annualized ($M)	$17.02	$15.47
Per Vehicle ($)	$20.32	$12.07

9 16.7% = 17.6% compliance rate × 95% efficacy of the rule.
10 $1.94 million = $11.6 million × 16.7%.

4 Preliminary Regulatory Analysis: Cost Analysis

This section discusses the costs this draft proposed rule would impose on society. There are three sets of societal costs discussed under this cost section: the cost of implementing an ROV/UTV fix that addresses the debris penetration hazard; the costs associated with government oversight and compliance monitoring (considered negligible); and the deadweight losses or market impacts derived from the implementation of an ROV/UTV fix.

Like the benefits estimation, the time span of the cost analysis covers a 30-year period that starts in 2024, which is the expected year of implementation of the rule. This cost analysis presents all cost estimates in 2021 dollars, including cost estimates before 2021, using price index adjustments. This cost analysis also discounts costs in the future, using a 3 percent discount rate to estimate their present value.[11]

In this regulatory assessment, staff considers two solutions to the debris penetration hazards under the draft proposed rule, each with a separate set of costs.

1. Redesigned Floorboards: Manufacturers fully redesign floorboards where most of the material in the original floorboard is redistributed into a new shape and thickness that is required to address the debris penetration hazard. Manufacturers then redesign ROV/UTV models to enable the installation of the redesigned floorboards and meet the requirements of the new ROV/UTV proposed mandatory standards.

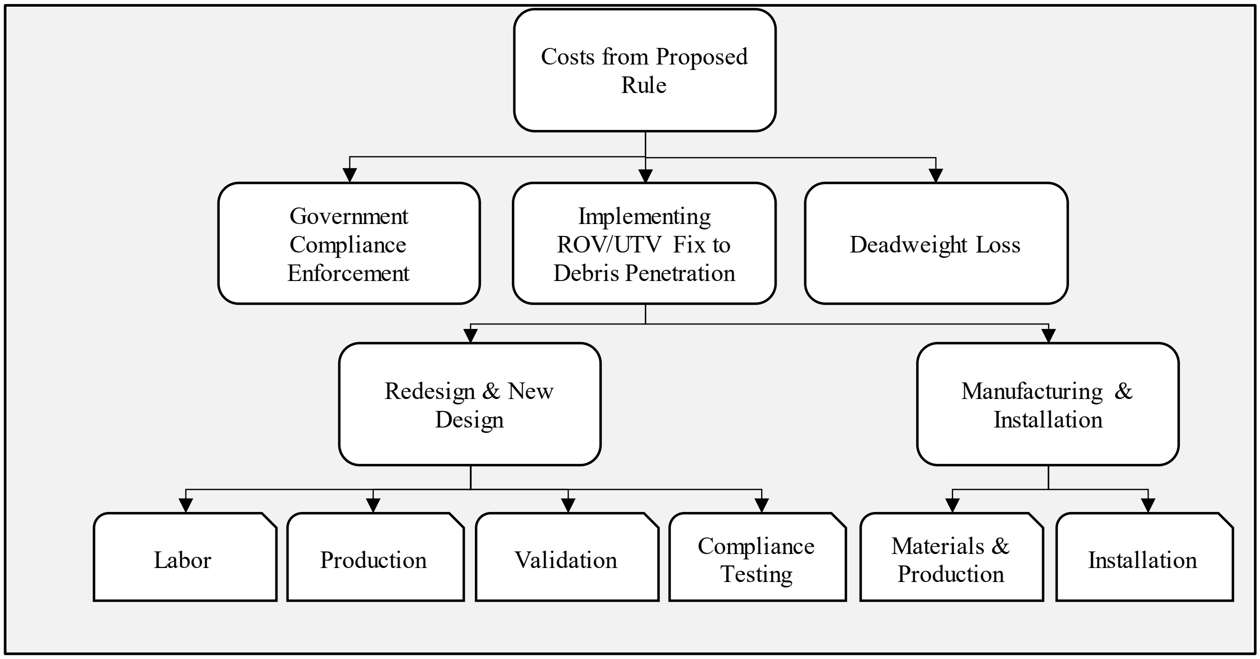
2. Floorboard Guards: Manufacturers redesign existing floorboards to add a 2' x 2' x 0.19" aluminum piece that acts as a floorboard guard and prevents debris penetration. This new aluminum piece's design blocks debris from hitting hazardous sections of the floorboard. Manufacturers then redesign ROV/UTV models to enable the installation of floorboards with floorboard guards that meet the requirements of the new ROV/UTV proposed mandatory standards.

This analysis assessed these two solutions as separate scenarios to produce a range of potential costs of compliance with the draft proposed rule. Some of the unit cost estimates in this analysis are based on SEA Ltd.'s testing and analysis. Under each scenario, staff assumed that 100 percent of manufacturers decide to adopt the solution being assessed. Therefore, staff estimated in each scenario the full cost of deploying that solution for all firms. In practice, however, manufacturers may choose a combination of the two solutions, or a different solution that proves more cost-effective. Staff welcomes public comments on the likelihood of manufacturers adopting either solutions or a solution not considered in this analysis.

[11] Discounting future estimates to the present allows staff not only to consider the time value of money, but also the opportunity cost of the investment, that is, the value of the best alternative use of funds.

These two scenario solutions each include the categories of cost shown in Figure B.8:

Figure B.8: Cost Element Structure for the Implementation of the Draft Proposed Rule



- Cost of Implementing an ROV/UTV fix to debris penetration.

  Manufacturers directly incur costs to redesign existing models and produce new designs that solve the debris penetration hazard, as well as the cost of producing and installing either a redesigned floorboard or floorboard guard on each new ROV/UTV manufactured after the draft proposed rule is implemented.[12] The increased cost is then passed indirectly on to wholesalers.

  The subcategories of costs for implementing an ROV/UTV fix to debris penetration are:

  - Cost of Redesigning Existing ROV/UTV Models and New Designs

    Manufacturers incur design costs that include redesigning existing ROV/UTV models, as well as designing future ROV/UTV models that enable the installation of a floorboard solution to the debris penetration hazard.

    Manufacturers would have to redesign existing ROV/UTV models with a floorboard solution if they wish to continue selling these models to consumers. Manufacturers, therefore, would have to allocate funds to produce a floorboard solution design, and adapt existing ROV/UTV models to enable the installation of

12 The draft proposed rule does not require manufacturers to update or replace the floorboard of vehicles manufactured or sold before implementation of the proposed ROV/UTV mandatory standards.

a floorboard solution. Manufacturers would likely incur expenditures in design labor, design production, design validation, and compliance testing. Each of these subcategories of cost are discussed below.

- Cost of Design Labor
  The cost to compensate model designers employed by the manufacturer (or a third-party design shop) for the time to produce a blueprint of the redesigned ROV/UTV model.

- Cost of Design Production
  The cost of materials and labor required to fabricate prototypes of the ROV/UTV model.

- Cost of Design Validation
  The cost of conducting validation testing of prototypes to ensure proper functioning of the redesigned ROV/UTV model and conformance with preset requirements established by the manufacturer. This is customarily conducted through in-house indoor sled testing.

- Cost of Compliance Testing
  The cost of conducting formal third-party compliance testing to verify compliance with the requirements of the new ROV/UTV mandatory standards. Compliance testing is customarily conducted through third party testing.

Manufacturers would also be required to upgrade all new designs with the floorboard solution. A large-scale ROV/UTV manufacturer[13] conveyed to staff that once existing models have been redesigned with a working floorboard solution, new models can adapt such a solution at a minimal cost. Therefore, the additional cost of implementing a debris penetration solution onto future designs is considered negligible, and it is not addressed further in this analysis.

- Cost of Manufacturing and Installing a Floorboard Solution

  Manufacturers directly incur costs to produce the floorboard solution of their choice[14] and install it in every new vehicle manufactured after the implementation

[13] CPSC staff conducted a virtual meeting on February 7, 2022, with a large manufacturer's representative to discuss the cost of implementing an ROV/UTV fix to the debris penetration hazard.

[14] The floorboard solution can be fabricated in-house by the manufacturer or by a third-party contractor hired by the manufacturer.

of the draft proposed rule. Manufacturers would likely incur expenditures to purchase the required materials to fabricate the floorboard and produce and install the selected floorboard solution. Each of these subcategories of cost are discussed below.

  - Cost of Materials and Production of the Floorboard Solution
    Staff assumed that the production cost of the floorboard solution closely matches the production cost of the original floorboard. Therefore, the incremental production cost is negligible, and the estimates in this subcategory focus exclusively on the incremental cost of the materials required to produce the floorboard solution.

  - Cost of Installation of the Floorboard Solution
    Staff assumed that the installation cost of the floorboard solution closely matches the installation cost of the original floorboard. Therefore, the incremental installation cost is negligible.

- Cost of Government Oversight and Compliance Monitoring.

  Staff does not expect the implementation of the draft proposed rule to require significant resources or additional oversight and compliance monitoring by CPSC. CPSC can reasonably provide oversight and monitoring of the new ROV/UTV floorboard requirements with existing resources. Therefore, staff assumed the additional cost incurred by the government to provide additional oversight and compliance monitoring to be of an insignificant magnitude, and thus, it is not addressed further in this analysis.

- Deadweight Loss.

  The requirements for ROVs/UTVs from the draft proposed rule increase the marginal cost of production for manufacturers. Manufacturers can transfer some, or all, of the increased production cost to consumers through price increases.[15] [16]

  At the margins, some producers may exit the market because their increased marginal costs now exceed the market price. Likewise, a fraction of consumers is now excluded from the market because the increased market price exceeds their personal price threshold for purchasing an ROV/UTV. Deadweight loss[17] is the measure of the losses faced by these marginal producers and consumers, who are forced out of the market due to the new requirements of the draft proposed rule. For this analysis, staff estimated deadweight loss for each year the draft proposed rule is expected to have an impact on marginal cost and market price. The estimate assumes that producers based their production decisions on the long-term impacts of the rule on their cost of production.

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15 An increase in the marginal cost of production in a competitive market normally is followed by an increase in the prices at which products are traded. The portion of the increased production costs that are paid for by consumers through higher market prices depend on the price responsiveness of demand and supply of the product. The price responsiveness of demand and supply are measured by the price elasticity of demand and supply, respectively. Price elasticity is a measure of how responsive the volume of product demanded or supplied in the market is to a change in the price of such product. Price elasticity is estimated as the ratio of the percentage change in the volume demanded or supplied as a result of a percentage change in price, or $\varepsilon = {}^{\Delta\%Q}/_{\Delta\%P}$. For most products, the elasticity of demand is a negative number that indicates price increases lead consumers to demand less of the product; while the elasticity of supply is a positive number that indicates an increased willingness to offer products in the market as the price of the product increases.

16 More precisely, the change in the market price of equilibrium (P_1 - P_0) that follows an increase in production costs (C_p) in a competitive market can be estimated as $P_1 - P_0 = \Delta C_p \left(\frac{\varepsilon_s}{\varepsilon_s - \varepsilon_d}\right)$, where ε_s is the elasticity of supply and ε_d is the elasticity of demand. In a market with a completely inelastic demand ($\varepsilon_d = 0$), producers can transfer the entire change in the cost of production to consumers through price increases. The highest the elasticity of demand, the lowest the portion of the increased production costs that can be transferred to consumers through price increases.

17 The deadweight loss (DL) is estimated as $DL = (Q_0 - Q_1)\frac{\Delta C_p}{2}$, where Q_0 is the expected market volume absent the proposed rule, Q_1 is the expected market volume after the impacts of the rule, and ΔC_p is the average long-term change in the cost of production. Q_0 -the expect market volume absent the proposed rule- is forecasted for each year in the time horizon of the analysis using ROV/UTV market volume trends from the North American Utility Vehicle Sales from 2005 to 2019. Q_1 -the expected market volume after the impacts of the rule- is estimated from Q_0, the average price, price elasticities of demand and supply, and the change in the cost of production using the following formula: $Q_1 = Q_0 \left(1 + \frac{\Delta C_p}{P_0} \frac{\varepsilon_s \varepsilon_d}{\varepsilon_s - \varepsilon_d}\right)$. The average long-term variable cost of production is estimated spreading large one-time costs--such as the cost of redesigning all existing ROV/UTV models within a short-period of time--over the planning horizon of the analysis and adding this estimate to the average annual short-term variable cost. To assess the effective market impact of the proposed rule, ΔC_p also includes a markup of 38 percent to cover the wholesalers' distribution costs (see Goldberg, Pinelopi 1995).

The following two subsections present the cost estimates for each of the two scenarios for compliance with draft proposed rule.

4.1 First Compliance Scenario: The Cost of Redesigned Floorboards

This subsection presents cost estimates for the scenario that assumes all manufacturers install a fully redesigned floorboard on each new ROV/UTV to comply with the draft proposed rule. Manufacturers would also redesign all existing and future ROV/UTV models to allow proper installation of the redesigned floorboards.

4.1.1 Cost of Redesigning ROV/UTV Models

Staff estimated the cost of redesigning all existing ROV/UTV models by multiplying the unit cost of redesigning each existing model[18] by the number of ROV/UTV models to be redesigned. Each of these factors are discussed in more detail below.

4.1.1.1 Unit Cost of Redesigning ROV/UTV Models

Staff estimated the unit cost of redesigning existing ROV/UTV models in two steps. First, staff estimated the unit cost of redesigning a single or "first" model before achieving any cost improvements.[19] Second, staff developed a cost improvement curve to account for economies of scale in the redesign of many models, and the efficiency gains from specialization and learning.

Staff estimated the unit cost of the "first" model using information from multiple sources, including laboratory tests performed to measure speeds and energy levels at which debris penetrate ROV/UTV floorboards.[20] CPSC staff produced estimates of the cost of redesigning a ROV/UTV at each stage of the design process:

- Cost of Design Labor
  Staff estimated it would require a team of two designers 1 month to produce a final blueprint of an ROV/UTV model design that complies with the requirements of the draft proposed

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18 As discussed earlier, the additional design cost to enable the installation of the redesigned floorboards on new ROV/UTV model designs is considered negligible; therefore, this section only presents cost estimates for the redesign of existing ROV/UTV models.

19 The design costs per ROV/UTV model are expected to decrease as the number of redesigned ROV/UTV models increases (*i.e.*, fixed costs spread over additional models, increased level of experience redesigning ROV/UTV models).

20 CPSC Study of Debris Penetration of Recreational Off-Highway Vehicle Floorboards conducted under contract by SEA Ltd., in 2020/2021.

rule, or approximately a total of 347 hours.[21] The average compensation rate of a designer is $63.96 per hour[22] for a total cost of $22,536 per redesigned model in 2021 dollars.

- Cost of Design Production
  Staff estimated the cost of fabrication of each floorboard at $2,000 per floorboard prototype. Staff estimated an average of three floorboard prototypes would be required per model redesign for a total production cost of $6,000 per model.

- Cost of Design Validation
  Staff estimated 2 days of validation testing would be required per each redesigned ROV/UTV model for a total of $59,372 per model.[23]

- Cost of Compliance Testing
  Staff estimated that, on average, two ROV/UTV models would be tested per day of sled testing or $14,843 per redesigned model.[24]

Based on the unit costs, the total "first" model cost per redesigned ROV/UTV model is $102,751.[25] This estimate is before the consideration of cost improvements from economies of

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[21] CPSC staff estimated it would take up to two-person months to modify an existing ROV/UTV model that does not comply with the requirements of the draft proposed rule, with a maximum of 4 months and a minimum of 1 month. Source: Notice of Proposed Rulemaking to Establish a Safety Standard for Recreational Off-Highway Vehicles. September 2014. This is 346.67 hours, the average number of hours per month of 173.33 (40 hours a week x 52 weeks a year/12 months) times 2 (two-person months).

[22] As of September 2021, the average total hourly compensation for management, professional, and related workers was estimated at $63.96 (Bureau of Labor Statistics, Table 2 - Employer Costs for Employee Compensation for Civilian Workers by Occupational and Industry Group, https://www.bls.gov/news.release/ecec.t02.htm). The total cost for two-person months as of September 2021 is $22,172.8 (346.67 hours times $63.96). Adjusted by the CPI price index, this estimate increases to $22,535.89 ($22,172.8 x 278.802 / 274.31) as of December 2021 (Bureau of Labor Statistics – Consumer Price Index for All Urban Consumers, Series ID CUUR0000SA0, 1982-84 base period, https://data.bls.gov/cgi-bin/surveymost?cu).

[23] As part of the CPSC study on debris penetration, SEA Ltd., conducted a total of 5 days of validation testing for a total cost of $138,570, or $27,714 per day as of September 2020. The cost of 2 days of testing brought forward to the end of 2021 using the CPI price index for all urban consumers is $59,732.36 ($27,714 per day x 2 days x 278.802 / 260.28).

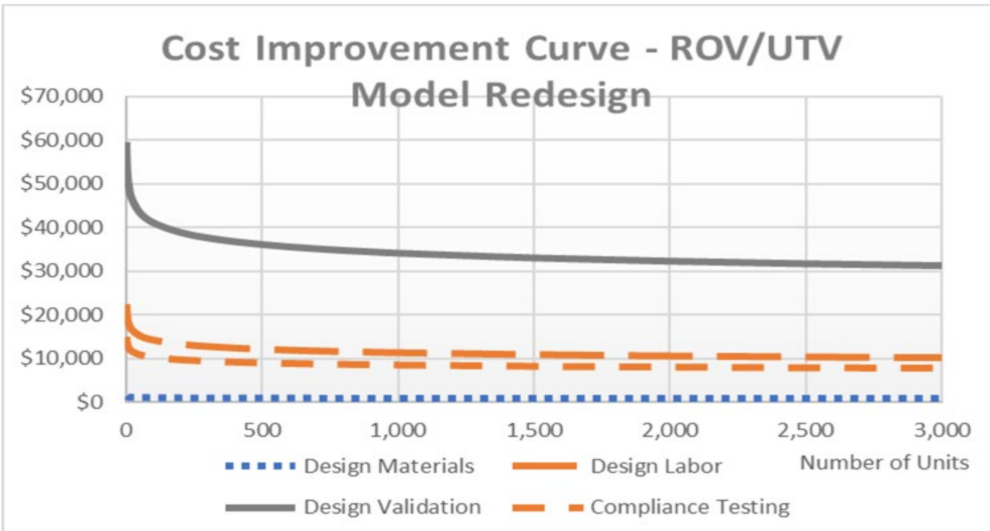
[24] The cost of validation testing from the CPSC contract with SEA Ltd., is $27,714 per day as of September 2020. CPSC staff estimates a total of three validation tests can be performed per day of third-party validation testing; however, the logistics involved in validation testing may reduce it to an average of two tests per day. The cost per model in dollars as of the end of 2021 is then $14,843 ($27,714 per day/2 models per day x 278.802/260.28).

[25] $102,751.34 = $22,535.89 (labor cost) + $6,000 (floorboard fabrication) + $59,372.36 (validation testing) + $14,843.09 (compliance testing).

scale and learning in model design.[26] To account for cost improvements, as the number of ROV/UTV models that are redesigned increases, staff used a cost improvement curve. The improvement curve assumes that every time the number of units produced doubles, there is a 5.4 percent reduction in the average redesign cost per ROV/UTV model.[27]

Figure B.9 shows the cost improvement trends for each of the design cost components discussed earlier:

Figure B.9: Redesign Cost Improvement Curve – Scenario I (Redesign Floorboards)



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26 The traditional definition of "learning curves" —or more properly in this case "cost improvement curves"—is centered on the observation that the cost per unit is reduced by a certain percentage every time the number of units produced doubles. The most cited models are derived from T.P. Wright (1936 - cumulative average unit cost) and J.R. Crawford (1944 - specific unit cost). The functional form in both of these models is: $C(X) = AX^{\propto}$, where C(X) is the cost function at level of production X, A is the cost of the first (theoretical) unit, X is the number of units produced, and α is the slope. In Wright's model, C(X) is the cumulative average cost (the form used here); while in Crawford's model, C(X) is the cost of the last unit produced.

27 For simplicity, staff assumed each of the redesign cost categories discussed here follow the same cost improvement trend. The cost improvement curve -or learning curve- used by staff has the following functional form: $C(X) = AX^{\propto}$, where C(X) is the cumulative average cost per unit at each level of production, A is the cost of the first (theoretical) unit, X is the number of units produced, and α is the slope. A 5.4% cost improvement implies the value of the slope α is -0.08 (given the function form a doubling in production results in a cost improvement of $1 - 2^{-0.08} = 5.39\%$). Cost improvement curves are usually estimated econometrically using available cost / manufacturing data; however, in the absence of such information, CPSC selected the cost improvement percentage based on cost improvement curves from similar activities and derived the parameters.

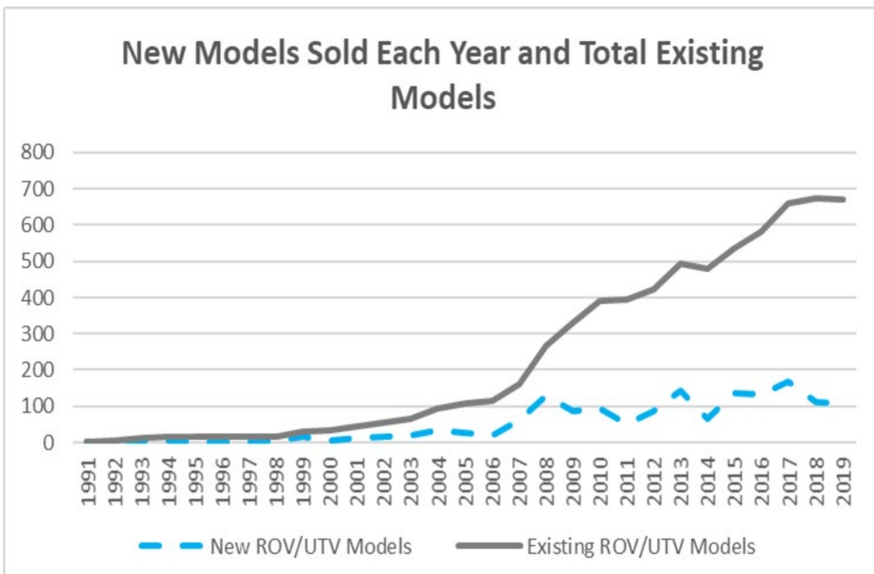
The trends in the chart show that when manufacturers redesign 3,000 ROV/UTV models in a particular year, the average redesign cost per model in that year would reach almost half the redesign cost of the "first" model (overall a cost of around $52,000 per model).

Since the redesign cost of models varies with the number of models redesigned each year, it is pertinent to discuss–before the discussion of unit cost per model–the forecasted number of models.

4.1.1.2 Number of Redesigned ROV/UTV Models

Figure B.10 shows the number of new models sold during the period 1991 through 2019, as well as an estimate of the total number of ROV/UTV models in use by consumers during the same period.[28] For instance, in 2019, a total of 107 new models were introduced; the same year an estimated 672 models were in use by ROV/UTV owners/users.

Figure B.10: Number of Models for Sale and Total Models in Use



Staff forecasted the number of new models every year in the 30-year study period by applying exponential smoothing forecasting techniques[29] to the number of new models produced.[30] Then,

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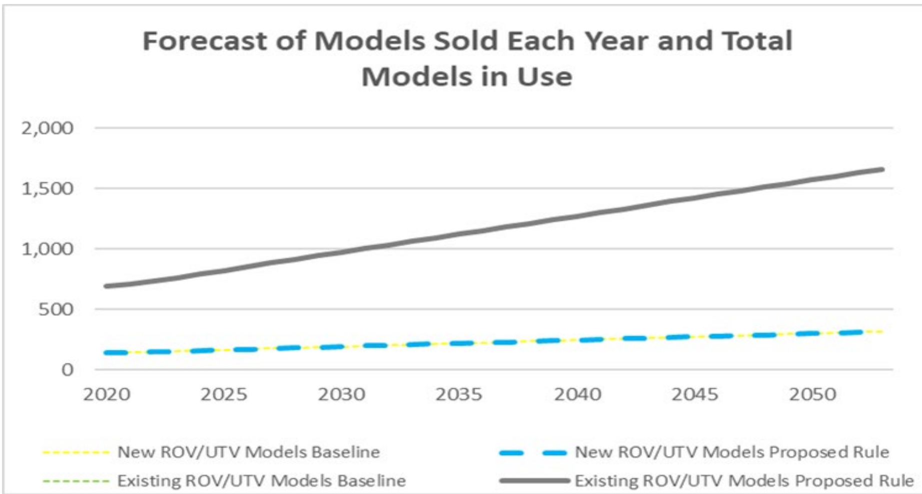
28 The number of models sold in each year of this period was estimated using the North American Utility Vehicle Sales from 1991 to 2019. It excludes ROV/UTV models designed for the use of children (*i.e.*, Minis).

29 Exponential smoothing is a time series-forecasting technique that produces projections that are weighted averages of past observations, with weights that decay exponentially as the observations get older. More recent observations are, therefore, assigned heavier weights and carry more importance in the forecast.

30 CPSC staff developed two sets of forecasts, the first set (or baseline forecast) assumes no impacts from the proposed rule, while the second set considers a small reduction in the number of models resulting the market

staff used the forecast of the number of models to estimate how many models would be in use in every year in the 30-year study period by applying a statistical distribution of model life rates[31] based on the average number of years a model is offered for sale in the market for new ROVs/UTVs.

Figure B.11: Forecast of Models for Sale and Total Models in Use



The chart above shows the number of new models sold and the number of models in use during each year within the 30-year study period. In 2023, a year before the assumed implementation of the draft proposed rule, the number of ROV/UTV models in use is 762. This is the number of existing models that manufacturers would be required to redesign.[32] Staff assumed for the purpose of this analysis, that redesign of all existing models would occur over 2 years, from 2024 to 2025, at 381 models per year. While the proposed effective date for the draft rule is 6 months after promulgation, staff assumed manufacturers would prioritize redesigning the most popular models before the effective date, while stockpiling units for other models whose redesign would

impacts of introducing the draft proposed rule. Because the cost impacts of the draft proposed rule are relatively small, the difference between the two sets of forecasts are small and not noticeable in the chart below.

31 A two-parameter gamma distribution was used to forecast model survival rates with a shape parameter of 5 and scale parameter of 1. These distribution parameters are consistent with a mean model duration of 5 years, which was estimated subtracting the year of model introduction from the year the model was discontinued from the North American Utility Vehicle Sales database. The distribution of model life rates mentioned above is the converse of the distribution of model survival rates.

32 Starting on the year of implementation of the rule (expected in 2024), all existing and new models will have to include a floorboard solution that complies with the requirements of the new standard in order to be sold to new/prospective ROV/UTV customers. Since the incremental cost of redesigning new models is negligible, the redesign cost is only estimated for existing models requiring new blueprints that enable the installation of the redesigned floorboards.

occur after the effective date. Staff welcomes public comment on the redesign process of ROV and UTV models and the rapidity with which this is able to occur.

Due to cost improvements associated with redesigning a relatively large number of ROV/UTV models (381) in each of the first 2 years, staff estimated the initial cost per model redesign to drop from $102,751 to an average of $53,877 each year. Therefore, the industry incurs a redesign cost of $20.51 million in 2024 and 2025, respectively. The total redesign costs over the 30-year study period are $41.02 million. The total redesign costs are equivalent to a present value of $39.24 million at a 3 percent discount rate. The following table summarizes the ROV/UTV redesign cost under the redesigned floorboard scenario:

Table B.12: Redesign Costs in Scenario I (Redesign Floorboards)

Redesigned Floorboard Scenario	Cost per Redesign Model ($M)	Number of ROV/UTV Models	ROV/UTV Redesign Cost ($M)
2024	$0.054	381	$20.51
2025	$0.054	381	$20.51
Overall	$0.054	762	$41.02
Present Value			$39.24

4.1.2 Cost of Manufacturing a ROV/UTV Floorboard Solution

Staff estimated the cost of producing and installing[33] redesigned ROV/UTV floorboards on all new ROVs/UTVs manufactured after the implementation of the draft proposed rule, by multiplying the unit cost of each floorboard, by the number of floorboards to be installed. These components are discussed in more detail below.

4.1.2.1 Unit Cost of Redesigning Floorboards

Staff estimated the unit cost of the redesigned ROV/UTV floorboard in two steps. First, staff used unit costs informed by laboratory tests performed to measure floorboard resistance at different speeds, for the additional cost of production and materials as the cost of the "first" redesigned floorboard in the cost improvement curve.[34] Second, staff produced an estimate of the

31 As discussed earlier, the additional cost of installing redesigned floorboards on new ROVs/UTVs is considered negligible; therefore, this section only presents cost estimates for the additional production costs (more specifically the additional materials) of the redesign floorboards.

34 The traditional definition of "learning curves" —or more properly in this case "cost improvement curves"—is centered on the observation that the cost per unit is reduced by a certain percentage every time the number of units produced doubles. The most cited models are derived from T.P. Wright (1936 - cumulative average unit cost) and J.R. Crawford (1944 - specific unit cost). The functional form in both of these models is: $C(X) =$

average additional cost per floorboard once manufacturers started producing compliant floorboards in large quantities; the cost improvement curve to render estimates in line with the subject matter experts in CPSC's Directorate for Engineering assessed would be the cost after economies of scale take effect.

Staff estimated the incremental cost of the "first" ROV/UTV floorboard using information from laboratory tests performed to measure debris penetration resistance of ROV/UTV floorboards. Staff estimated the cost of a floorboard resistant to debris penetration at 10 mph to be $264.[35] Staff then produced an estimate of the cost of the redesigned floorboard considering cost improvements from economies of scale, as well as other considerations, like the reuse of most of the material contained in existing floorboards. The average incremental cost per floorboard under these conditions is not expected to exceed $10 per floorboard.

Staff calibrated a cost improvement curve that assumes each time the number of floorboards produced doubles, there is a 15.9 percent reduction in the average floorboard cost.[36] Figure B.13 shows the cost improvement curve at different scales of floorboard production:

$AX^{\propto}$, where C(X) is the cost function at level of production X, A is the cost of the first (theoretical) unit, X is the number of units produced, and α is the slope. In Wright's model, C(X) is the cumulative average cost (the form used here); while in Crawford's model, C(X) is the cost of the last unit produced.

35 CPSC Study of Debris Penetration of Recreational Off-Highway Vehicle Floorboards conducted under contract by SEA Ltd., in 2020/2021. SEA tested multiple floorboards, a floorboard that successfully resisted debris penetration at 10 mph was purchased for $259 in August 2021. This estimate was brought forward to the end of 2021, using the Consumer Price Index for all Urban Consumers ($263.96 = $259 x 278.802 / 273.567).

36 A 15.9 percent cost improvement implies the value of the slope α is -0.25 (given the function form a doubling in production results in a cost improvement of $1 - 2^{-0.25}$ = 15.91%).

Figure B.13: Prod/Materials Cost Improvement Curve - Scenario I (Redesigned Floorboards)

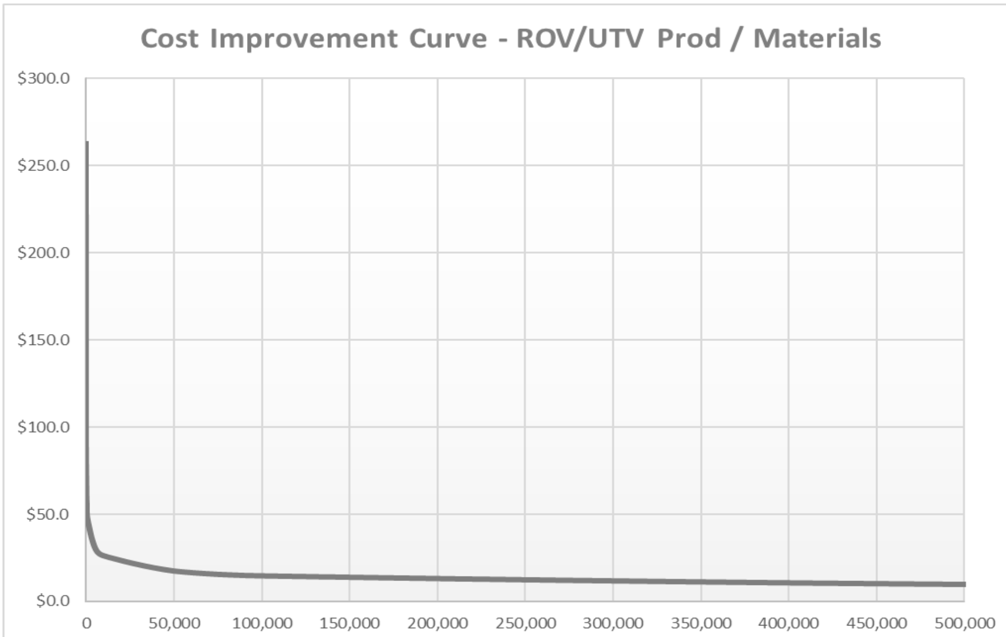


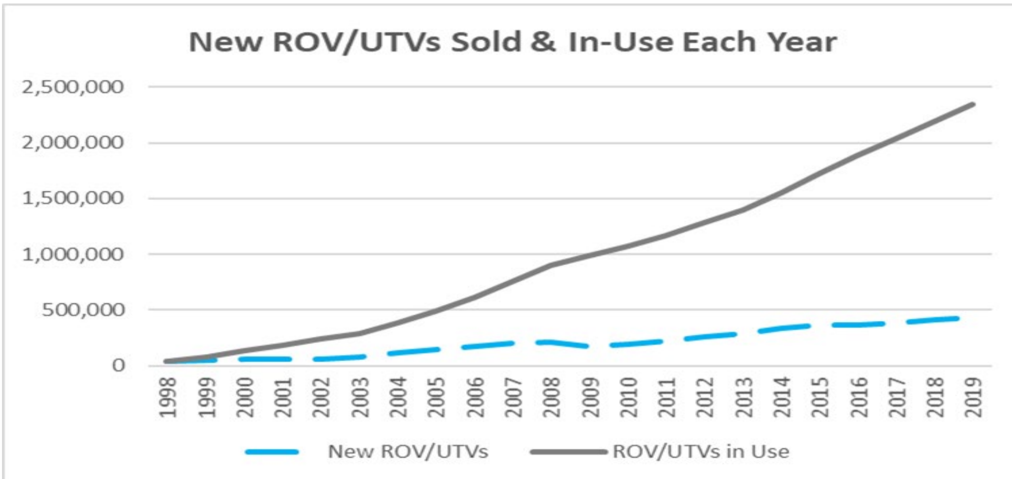
Figure B.13 shows that with 100,000 floorboards produced, the average cost drops to less than $15 per redesigned floorboard. In most years, sales of new ROV/UTVs are above 500,000 units, which implies an average additional cost of less than $10 per redesigned floorboard. The average floorboard cost, as shown in the chart, depends on the number of sales per year, which is discussed below.

4.1.2.2 Number of ROVs/UTVs Sold

Figure B.14 shows the number of new ROVs/UTVs sold during the period 1998 through 2019, as well as an estimate of the total number of ROVs/UTVs in use during the same period.[37] During 2019, firms sold 429,135 new ROVs/UTVs to consumers, and the number of ROVs/UTVs in use during the same year averaged 2.34 million.

[37] The number of ROVs/UTVs sold each year during the period 1998 to 2019 was estimated using the North American Utility Vehicle Sales database. For our analysis, the number of vehicles excludes ROVs/UTVs sold for the use of children (*i.e.*, ROV/UTV Minis).

Figure B.14: ROV/UTVs Sold and In-Use Each Year – Scenario I (Redesigned Floorboards)



Staff used exponential smoothing techniques to forecast the number of new ROV/UTV sales within the 30-year study period.[38] Staff also forecasted the number of ROVs/UTVs in use by applying a statistical distribution of product life rates[39] to the fleet.

[38] CPSC staff developed two sets of ROV/UTV forecasts, the first set (or baseline forecast) assumes no impacts from the proposed rule, while the second set considers a small reduction in the number of ROVs/UTVs from the market impacts of the proposed rule. Because the cost impacts of the proposed rule are relatively small, the difference between the two sets of forecasts is small and not noticeable.

[39] A two-parameter gamma distribution was used to forecast ROV/UTV survival rates with shape parameter of 6 and scale parameter of 1 corresponding to a mean ROV/UTV duration of 6 years. The distribution of product life rates mentioned in the paragraph above is the reciprocal of the distribution of survival rates.

Figure B.15: Forecast of ROV/UTVs Sales and ROV/UTVs In-Use – Scenario I (Redesigned Floorboards)

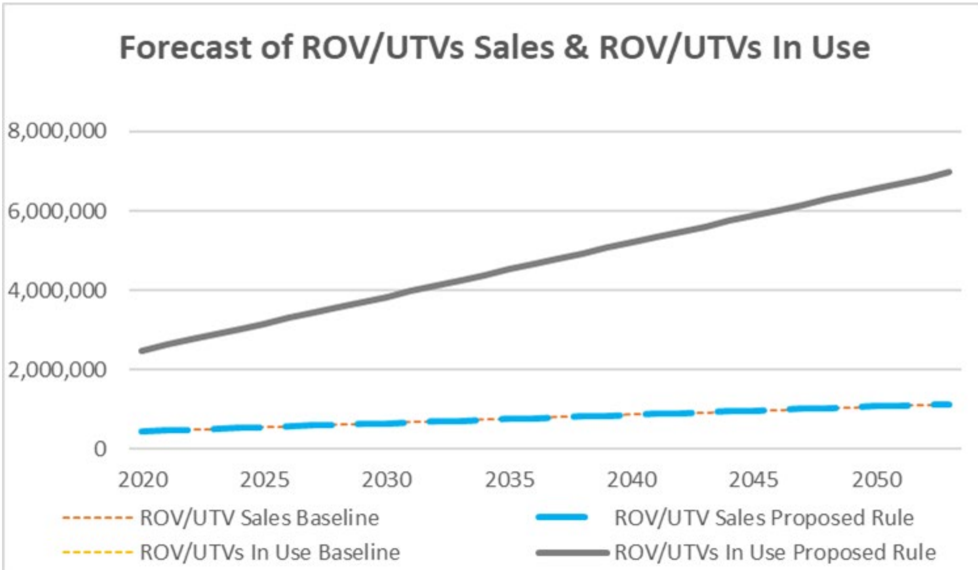
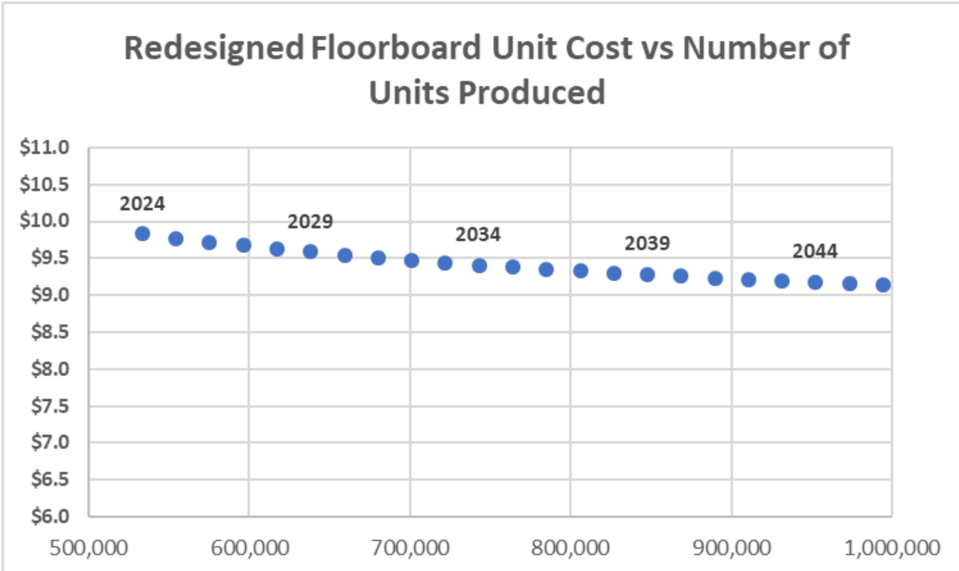


Figure B.15 shows ROVs/UTVs sales and the number of ROVs/UTVs in use during the 30-year study period. Since each new ROV/UTV sold requires a redesigned floorboard, the number of floorboards to be fabricated is equivalent to the number of units sold during the period 2024 to 2053. Figure B.16 shows the number of floorboards produced over time and the corresponding (undiscounted) cost per unit.

Figure B.16: Redesigned Floorboard Unit Cost by Production Volume – Scenario I (Redesigned Floorboards)



The total cost of producing and installing redesigned floorboards in every new ROV/UTV is $227.09 million over the 30-year study period. The equivalent present value at a 3 percent discount rate is $142.15 million. Table B.17 summarizes these costs:

Table B.17: Additional Cost of Floorboards on ROV/UTVs – Scenario I (Redesigned Floorboards)

Redesigned Floorboard Scenario	Average Cost per Redesigned Floorboard ($)	Millions of New ROVs/UTVs with Redesigned Floorboards	Cost of Redesigned Floorboards on ROVs/UTVs ($M)
2024 - 2053	$9.04	25.12	$227.09
Present Value			$142.15

The total cost of implementing the redesigned floorboard fix for debris penetration is summarized in the Table B.18:

Table B.18: Redesign and Production Cost – Scenario I (Redesigned Floorboards)

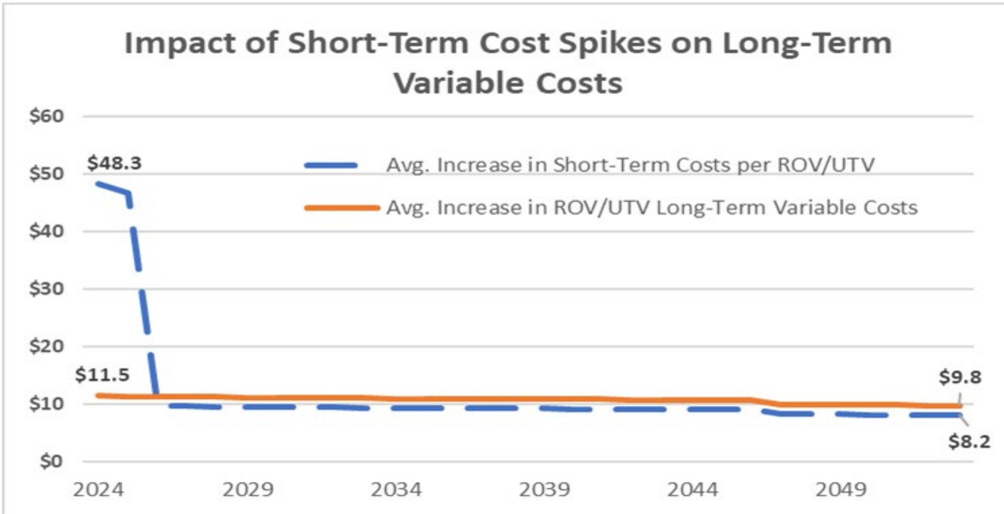
Cost of Redesigned Floorboard Fix	Average Cost per ROV/UTV ($)	Millions of New ROVs/UTVs	Cost of Redesigned Floorboards ($M)	Present Value ($M)
Cost of Redesigning Existing Models	$1.63	25.12	$41.02	$39.24
Cost of Producing Redesigned Floorboards	$9.04	25.12	$227.09	$142.15
Cost of Redesigning Floorboard Fix	**$10.67**	**25.12**	**$268.11**	**$181.39**

4.1.3 Deadweight Loss

To produce an estimate of the market-related losses to producers and consumers, staff estimated the annual average increased cost of production, the resulting increase in average prices, and reduction in volumes traded in the ROV/UTV market. Staff then used those estimates to calculate the deadweight loss for each year in the 30-year study period.

Staff assumed that manufacturers would increase prices in response to changes in the average long-term variable costs of producing ROVs/UTVs. Staff calculated the expected changes in long-term variable costs by spreading the spikes in short-term costs from complying with the draft proposed rule, as shown in Figure B.19:

Figure B.19: Long-Term Impact of Short-Term Cost Spikes – Scenario I (Redesigned Floorboards)



Staff augmented the average long-term cost per ROV/UTV redesigned floorboard shown in Figure B.15 by a 38 percent[40] wholesaler distribution markup. This simulates the market impact that the draft proposed rule has on the ROV/UTV supply curve.

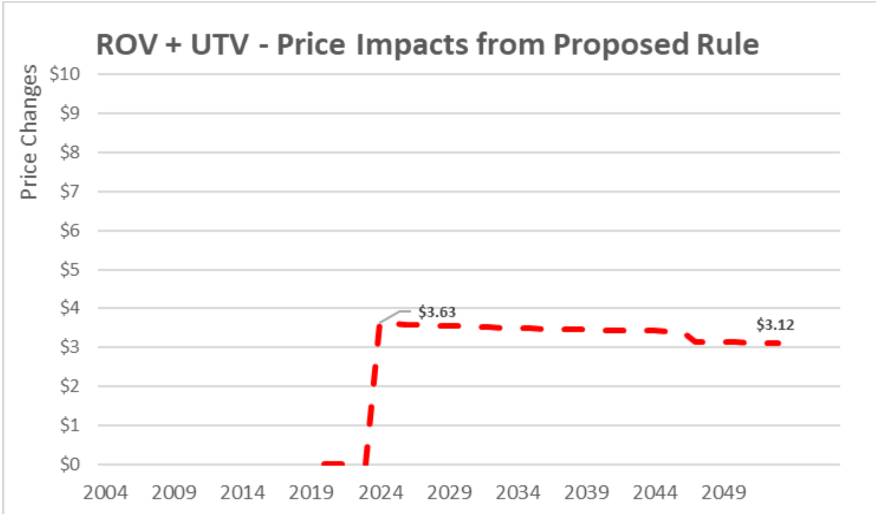
Staff adjusted the average annual prices from the period 2004 to 2019[41] to constant 2021 dollars[42] and then forecasted prices for the 30-year study period using exponential smoothing. The following charts in Figure B.20 show the prices in baseline conditions (assuming no draft proposed rule in effect) forecasted through 2053, as well as the price impacts of the proposed implementation of the rule.

40 The effective market impact is likely to include a markup to cover the wholesalers' distribution costs. The 38 percent markup comes from Goldberg 1995.

41 Average annual prices were estimated using the North American Utility Vehicle Sales database. Prices of ROV/UTV designed for the use of children were excluded from the weighted price average.

42 Prices were brought forward using the Consumer Price Index for All Urban Consumers from the Bureau of Labor Statistics.

Figure B.20: Price Impacts from the Rule under Scenario I (Redesigned Floorboards)



The impact of the rule in the ROV/UTV price is very small, accounting for less than 0.03 percent of the average market price.[43] Consequently, the change in market volume is also very small. The small price and quantity impacts result in deadweight losses under $6,000 per year, and aggregates to approximately $160,000 over the 30-year study period. In the context of this draft proposed rule, deadweight loss is not significant cost and is likely to be masked by other economic factors.

4.1.4 Total Cost Under First Compliance Scenario: Redesigned Floorboard

The following table summarizes the cost of the first compliance scenario; the design and production of redesigned floorboards:

43 The price impact is estimated with the formula $\Delta P = \Delta C_p \left(\frac{\varepsilon_s}{\varepsilon_s - \varepsilon_d}\right)$, which in this specific context means the change in price equals the change in long-term average cost (including a markup), times the ratio of the elasticity of supply to the difference between elasticity of supply and demand. Using the average change in production cost of $10.67 plus a 38 markup for distribution, Cp equals $14.73. The elasticity of supply and demand are estimated using the automobile vehicle market as a proxy (Goldberg, P) at 1.1 and -3.69, hence $\Delta P = \$14.73 \left(\frac{1.1}{1.1-(-3.69)}\right) = \$3.4$. This estimate differs slightly from the yearly estimates shown in the chart because the change in unit cost vary from year to year.

Table B.21: Total Cost of ROV/UTV Fix - Scenario I (Redesigned Floorboards)

Cost of Redesigned Floorboard Fix ($M)	Total Cost	Present Value
Cost of Redesigning Existing Models	$41.02	$39.24
Cost of Production of Redesigned Floorboards	$227.09	$142.15
Deadweight Loss	$0.16	$0.10
Cost of First Compliance Scenario	**$268.26**	**$181.49**

4.2 Second Compliance Scenario: The Cost of a Floorboard Guard

This subsection presents cost estimates for the scenario that all manufacturers produce and install a floorboard guard under the floorboard to comply with the draft proposed rule. Manufacturers would redesign floorboards to add a 2’ x 2’ x 0.19” aluminum piece that can prevent debris penetration. Manufacturers would also have to redesign all existing and future ROV/UTV models to allow proper installation of the floorboard guard.

4.2.1 Cost of Redesigning ROV/UTV Models

Staff estimated the cost of redesigning all existing ROV/UTV models to allow for the installation of floorboard guards by multiplying the unit cost of redesigning each existing model[44] by the number of ROV/UTV models to be redesigned. These two cost elements are discussed in more detail below.

4.2.1.1 Unit Cost of Redesigning ROV/UTV Models

Like the estimation method used with the first compliance scenario, staff estimated the unit cost of redesigning existing ROV/UTV models in two steps. First, staff estimated the unit cost of redesigning a single or “first” model prior to cost improvements. Second, staff developed a cost

[44] The additional design cost to enable the installation of the floorboard guards on new ROV/UTV model designs is considered negligible. This section focuses only in the costs of redesigning existing ROV/UTV models.

improvement curve to account for the diminishing cost of redesigning through economies of scale.[45]

Staff developed the unit cost of the “first” ROV/UTV model redesign from related studies and reports, including a set of laboratory tests performed to measure floorboard resistance at different speeds.[46] Staff produced unit cost estimates for four stages in the design process:

- Cost of Design Labor
  Staff estimated it would take two designers 1 month to produce final blueprints, or approximately 347 hours.[47] The average compensation rate for designer is $63.96 per hour for a total cost of $22,536 per redesigned ROV/UTV model in 2021 dollars.[48]

- Cost of Design Production
  Staff used information from its study on debris penetration[49] to produce an estimate of the cost per floorboard prototype at $500. Assuming an average of three floorboard prototypes per ROV/UTV model redesign, staff estimated a total production cost of $1,500 per redesigned model.

- Cost of Design Validation
  Staff estimated two days of validation testing per each redesigned ROV/UTV model for a total of $59,372.[50]

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45 Costs improvements are expected as fixed costs spread over additional model redesigns, and the level of experience and specialization redesigning ROV/UTV models for floorboard debris penetration increase.

46 CPSC Study of Debris Penetration of Recreational Off-Highway Vehicle Floorboards conducted under contract by SEA Limited in 2020/2021.

47 CPSC staff estimated each redesign would take up to two-person months, with a maximum of four months and a minimum of one month (Notice of Proposed Rulemaking to Establish a Safety Standard for Recreational Off-Highway Vehicles. September 2014). Two-person months are equivalent to 346.67 hours: the average number of hours per month of 173.33 (40 hours a week x 52 weeks a year/12 months) times 2.

48 The average total hourly compensation for management, professional, and related workers was estimated as of September 2021 at $63.96 (BLS, https://www.bls.gov/news.release/ecec.t02.htm). The total cost for two-person months as of September 2021 is then $22,172.8 (346.67 hours times $63.96). Adjusted by the CPI price index, this estimate increases to $22,535.89 ($22,172.8 x 278.802 / 274.31) as of December 2021 (CPI-U, ID: CUUR0000SA0, https://data.bls.gov/cgi-bin/surveymost?cu).

49 Conducted by SEA Limited under contract with CPSC (Debris Penetration of ROVs Floorboards).

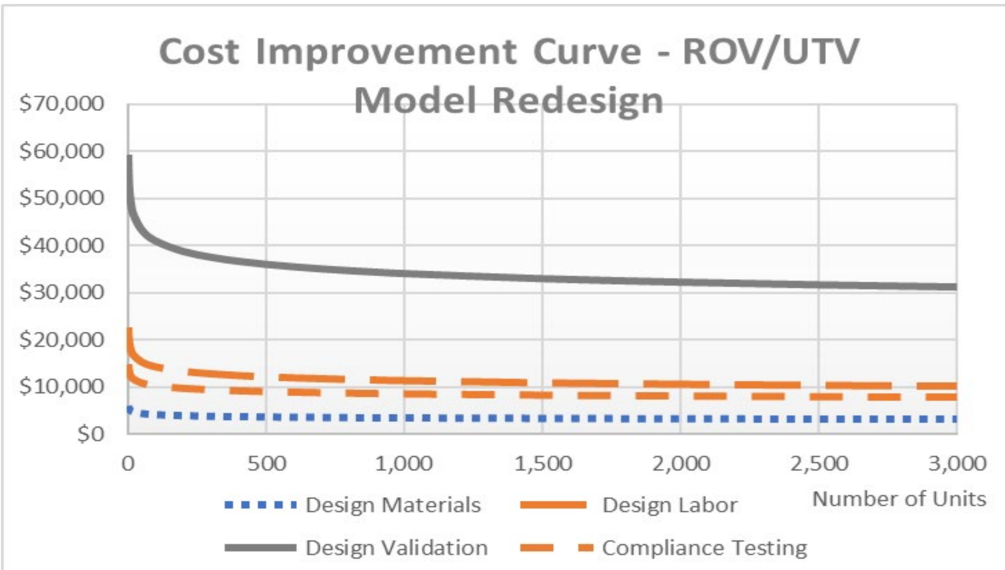
50 Ibid. SEA Ltd., conducted 5 days of validation testing for a total cost of $138,570, or $27,714 per day as of September 2020. The cost of 2 days of testing brought forward to the end of 2021 using the CPI price index for all urban consumers is $59,732.36 ($27,714 per day x 2 days x 278.802 / 260.28).

- Cost of Compliance Testing
  Staff estimated that, on average, two ROV/UTV models would be tested using the test sled method at $14,843 per model.[51]

Based on these inputs, staff estimated the total cost per "first" redesigned model is $98,251.[52] This is before considering the cost improvement from scale, specialization, and learning. Staff then used a cost improvement curve that calculates a 5.4 percent reduction in per unit cost every time the number of units redesigned doubles.[53]

Figure B.22 shows the cost improvement trends for each of the design cost components discussed earlier:

Figure B.22: Redesign Cost Improvement Curve – Scenario II (Floorboard Guards)



The average redesign cost per model is dependent on the number of models redesigned each year, which is discussed in the following section.

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51 The cost per day of sled testing, as provided by SEA Limited, was $27,714 as of September 2020. CPSC staff estimates that on average two models would be tested per day. The cost per model as of the end of 2021 is then $14,843 ($27,714 per day / 2 models per day x 278.802 / 260.28).

52 $98,251.34 = $22,535.89 (labor cost) + $1,500 (floorboard fabrication) + $59,372.36 (validation testing) + $14,843.09 (compliance testing).

53 CPSC staff assume the same cost trends for each design cost category. The slope of the cost improvement curve $C(X) = AX^{\propto}$ was estimated at α = -0.08 (a doubling in production results in a cost improvement of $1 - 2^{-0.08}$ = 5.39%).

4.2.1.2 Number of Redesigned ROV/UTV Models

Staff used the same forecast of the number of new models introduced each year and number of models in use by consumers for this compliance scenario as in the redesigned floorboard scenario (section 4.1.1.2).[54] The baseline data in 2019 reveals 107 new ROV/UTV models introduced and 672 existing ROV/UTV models used by consumers.

Staff used the baseline forecast of the number of new models to produce an estimate of new models that would need to be redesigned under the draft proposed rule[55]. Then, staff used the forecasted number of new models to estimate the number of models in use every year throughout the 30-year study period by applying a statistical distribution of model life rates.[56]

The forecast matches almost exactly the chart shown in section 4.1.1.2 with 762 ROV/UTV models in use in 2023. This value is the number of existing redesigned models that manufacturers would be required to redesign.[57] Staff assumed that manufacturers would spread the redesign activities over a period of two years, at 381 ROV/UTV models per year. While the proposed effective date for the draft rule is 6 months after promulgation, staff assumed manufacturers would prioritize redesigning the most popular models before the effective date, while stockpiling units for other models whose redesign would occur after the effective date. Staff welcomes public comment on the redesign process of ROV and UTV models and the rapidity with which this is able to occur.

The improvement over the cost of the "first" redesigned model would bring down the average cost per model from $98,251 to an average of $51,042 each year. Consequently, the ROV/UTV industry would incur redesign costs of $19.43 million in 2024 and 2025, respectively; as shown in Table B.23:

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54 The same baseline number of models is used for both compliance scenarios (see baseline data and forecast in the corresponding section of the first compliance scenario -"redesign floorboards"- for additional context). The number of models sold in each year of this period was estimated using the North American Utility Vehicle Sales from 1991 to 2019, excluding models design for children.

55 CPSC staff developed a second set of forecasts from the baseline forecast by considering the market impacts of the draft proposed rule. Due to the relatively small cost impacts of the draft proposed rule, the difference between the two sets of forecasts are not noticeable in the chart.

56 As discussed earlier, a two-parameter gamma distribution was used to forecast model survival rates with shape parameter of 5 and scale parameter of 1, consistent with an estimated mean model duration of 5 years. The model life rates distribution is the converse of the model survival rates distribution.

57 All existing and new models will have to include a floorboard solution- a floorboard guard in this case- that complies with the requirements of the new standard in order to be sold to new/prospective ROV/UTV customers; however, the additional cost of redesigning new models is considered negligible based on discussions with manufacturers, so the focus of the estimate are redesigned existing models only.

Table B.23: Redesign Costs in Scenario II (Floorboard Guards)

Floorboard Guard Scenario	Cost per Redesigned Model ($M)	Number of ROV/UTV Models	ROV/UTV Industry Cost ($M)
2024	$0.051	381	$19.43
2025	$0.051	381	$19.43
Overall	$0.051	762	$38.87
Present Value			$37.19

4.2.2 Cost of Manufacturing ROV/UTV Floorboard Guards

Staff estimated the cost of producing and installing[58] floorboards with floorboard guards on all new ROVs/UTVs by multiplying the additional cost per floorboard guards by the number of new ROVs/UTVs that would have a floorboard guard installed.

4.2.2.1 Unit Cost of Adding a Floorboard Guard

Staff estimated the unit cost of adding floorboard guards to floorboards in two steps. First, staff estimated the additional cost of the "first" floorboard with a floorboard guard in it, prior to any cost improvements.[59] Second, staff developed an estimate of the average cost of floorboard using a floorboard guard considering the efficiencies from economies of scale by calibrating and applying a cost improvement curve.

Staff estimated the incremental cost of the "first" floorboard with a floorboard guard to be $51.09 based on the cost of the materials considering a 2' x 2' x 0.19' aluminum sheet.[60] Staff then applied the cost curve which calculates a 5.5 percent reduction in average cost every time the number of ROVs/UTVs with a floorboard guard doubles.[61]

Figure B.24 shows the cost improvement curve at different scales of production:

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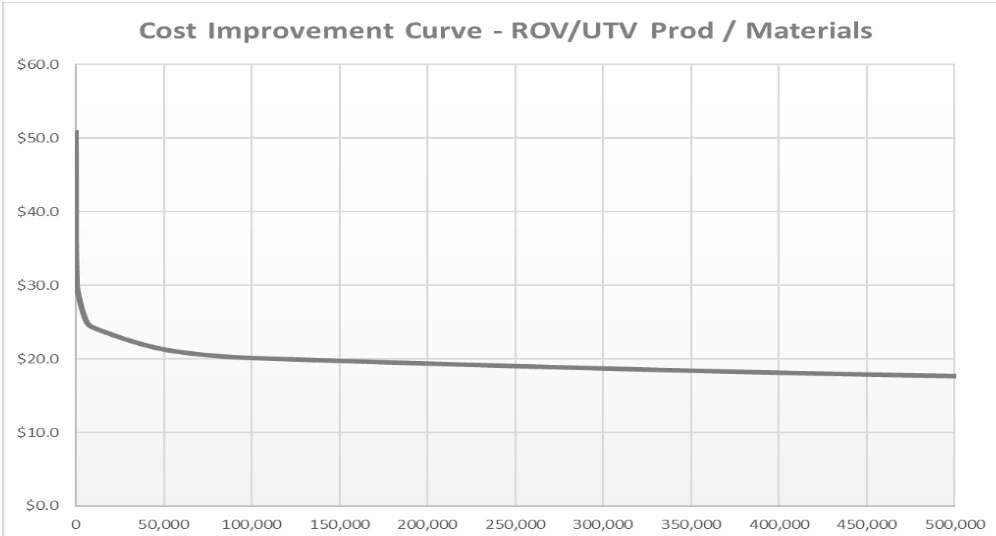
58 Like the first compliance scenario, the additional cost of installing floorboard guards in new ROVs/UTVs is considered negligible. The focus of the section is on the additional production costs of floorboard guards (more specifically the additional materials).

59 Cost improvements are expected due to process improvements and reuse of designs, additional learning and experience in the production process, and economies of scale in the acquisition of materials.

60 CPSC staff estimate this cost applying a 50% manufacturer discount to the Grainger retail price for an aluminum sheet of these characteristics, price at $102.17 as of the end of 2021.

61 The cost improvement curve with the same functional form as discussed earlier in the document, with a slope α of -0.08. A 5.5% cost improvement implies the value of the slope α is -0.081 (a doubling in production results in a cost improvement of $1 - 2^{-0.081} = 5.45\%$).

Figure B.24: Prod/Materials Cost Improvement Curve - Scenario II (Floorboard Guards)



This chart shows that with 100,000 floorboards produced the cost drops to an average of about $20. In most years, the sales of new ROV/UTV are greater than 500,000 units, which reduces the average cost to slightly above $17 per new ROV/UTV.

4.2.2.2 Number of ROVs/UTVs Sold

The baseline forecasts of sale volumes of new ROVs/UTVs and the number of ROVs/UTVs in use by consumers in section 4.1.1.2 are also applicable to this compliance scenario.[62] The baseline data in 2019 shows 429,135 new ROVs/UTVs sold and 2.3 million ROVs/UTVs in use by consumers.

Staff used the baseline forecast of the number of new ROVs/UTVs to produce an estimate of new ROVs/UTVs under the draft proposed rule.[63] Staff also forecasted the number of ROVs/UTVs in use by applying a statistical distribution of product life rates[64] to the total fleet. The forecasted volumes almost exactly match the volumes shown in the chart in section 4.1.1.2.

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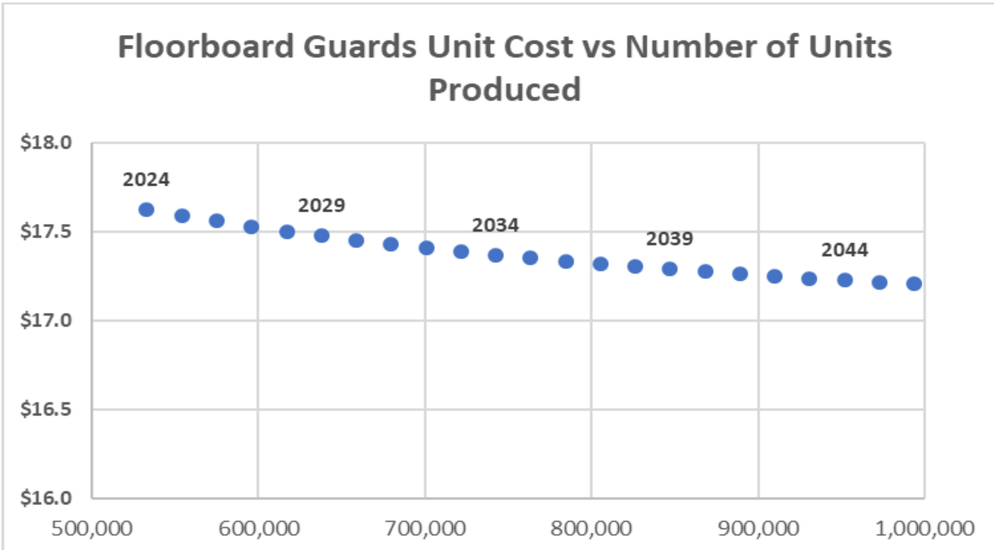
62 The number of ROVs/UTVs sold each year of the period 1998 to 2019 was estimated using the North American Utility Vehicle Sales database; it excludes ROVs/UTVs sold for the use of children (i.e.: Mini). The baseline data and forecasts applied to both compliance scenarios. See baseline data and forecast in section 4.1.1.2. for additional context.

63 CPSC staff developed a second set of forecasts subtracting from the baseline forecast of sales the volume impacts of the draft proposed rule. Due to the relatively small price, and hence, volume impacts of the proposed rule, the difference between the two sets of forecasts are barely noticeable.

64 A two-parameter gamma distribution was used to forecast ROV/UTV survival rates with shape parameter of 6 and scale parameter of 1, corresponding to a mean ROV/UTV duration of 6 years. The distribution of product life rates is the converse of the distribution of survival rates.

Additionally, Figure B.25 shows the number of floorboards produced over time and the corresponding cost per unit.

Figure B.25: Additional Floorboard Unit Cost by Production Volume – Scenario II (Floorboard Guards)



To calculate the total incremental cost of producing and installing floorboard guards in every new ROV/UTV over the 30-year study period, staff multiplied the average cost of a floorboard guard by the number of ROVs/UTVs produced. Staff calculated this cost to be $430.33 million. The equivalent present value at a three percent discount rate is $266.94 million. Table B.26 summarizes the cost producing ROV/UTV floorboards with floorboard guards:[65]

Table B.26: Additional Cost of Floorboards on ROV/UTVs – Scenario II (Floorboard Guards)

Floorboard Guard Scenario	Average Cost per Floorboard Guard	Millions of New ROVs/UTVs with Floorboard Guard	Cost of Floorboard Guard ($M)
2024 - 2053	$17.14	25.10	$430.33
Present Value			$266.94

65 Note that the number of ROVs/UTVs equipped with floorboards containing deflectors shields is slightly below the number of ROVs/UTVs under the first alternative with "redesigned floorboards". The reason for this slight difference is that the implementation of the floorboard guard solution is slightly more expensive, causing a slimly steeper increase in prices, and hence a slightly reduced sales volume.

The total cost of implementing the floorboard guards fix to debris penetration over the 30-year study period is summarized in Table B.27:

Table B.27: Redesign and Production Cost – Scenario II (Floorboard Guards)

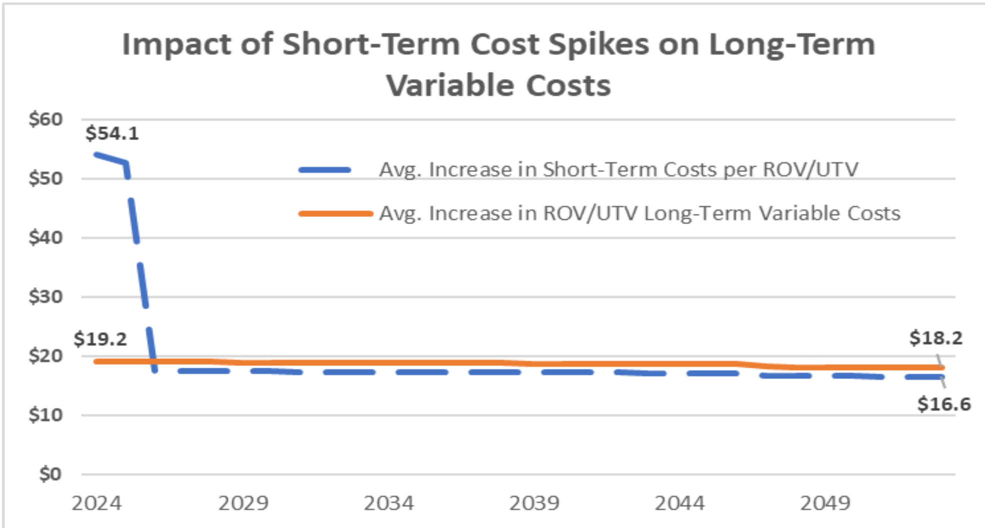
Cost of Floorboard Guard Scenario	Average Cost per ROV/UTV	Millions of New ROVs/UTVs	Cost of Floorboard Guard ($M)	Present Value ($M)
Cost of Redesigning Existing Models	$1.55	25.10	$38.87	$37.19
Cost of Producing Redesigned Floorboards	$17.14	25.10	$430.33	$266.94
Cost of Redesigning Floorboard Fix	$18.69	25.10	$469.20	$304.13

4.2.3 Deadweight Loss

Like the first compliance scenario, staff estimated the annual average increased cost of production associated with the new standard, the resulting increase in average prices, and reduction in volumes traded in the ROV/UTV market. Then, staff used those estimates to calculate the deadweight loss for each year of the analysis.

Staff calculated the expected changes in long-term variable costs by spreading out the spikes in short-term costs, as shown in Figure B.28:

Figure B.28: Long-Term Impact of Short-Term Cost Spikes – Scenario II (Floorboard Guards)

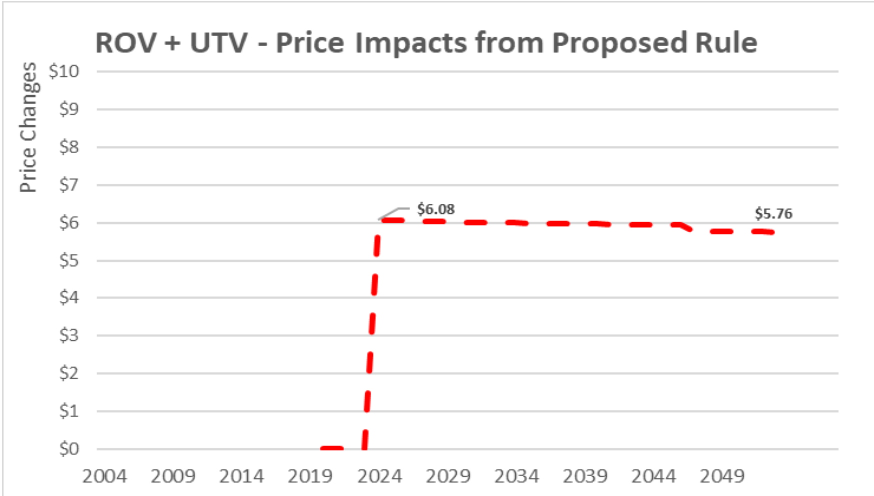


Then, staff augmented the estimated long-term cost presented in Figure B.20 by a 38 percent[66] wholesaler distribution markup to simulate the market impact of the draft proposed rule on the ROV/UTV supply curve.

Staff used the same forecasted baseline prices used in the first scenario – along with price sensitivities of demand and supply – to estimate price impacts of the draft proposed rule in this scenario.

[66] Goldberg 1995.

Figure B.29: Price Impacts from the Rule under Scenario II (Floorboard Guards)



As Figure B.29 shows, the impact of the draft proposed rule on the ROV/UTV price is slightly higher than in the first compliance scenario, but still very small, accounting for less than 0.045 percent of the average market price.[67] Consequently, the change in market volume would also be very small. The small price and quantity impacts result in deadweight losses per year under $20,000, and aggregates to approximately $470,000 over the 30-year study period. In the context of this draft proposed rule, the impact of deadweight loss is not significant.

4.2.4 Total Cost under Second Compliance Scenario: Floorboard Guards

Table B.30 summarizes the total cost of the second compliance scenario over the 30-year study period.

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67 The price impact is estimated with the formula $\Delta P = \Delta C_p \left(\frac{\varepsilon_s}{\varepsilon_s - \varepsilon_d}\right)$. Using the average change in production cost of $18.69 plus a 38 markup for distribution, C_p equals $25.79, and the elasticities of supply and demand for the automobile vehicle market (Goldberg, P) estimated at 1.1 and -3.69, hence $\Delta P = \$25.79 \left(\frac{1.1}{1.1-(-3.69)}\right) = \$5.9$. This estimate differs slightly from the estimates shown in the chart because unit costs vary from year to year.

Table B.30: Total Cost of ROV/UTV Fix - Scenario II (Floorboard Guards)

Cost of Floorboard Guard Fix ($M)	Total Cost	Present Value at 3%
Cost of Redesigning Existing Models	$38.87	$37.19
Cost of Production of Floorboard Guards	$430.33	$266.94
Deadweight Loss	$0.47	$0.30
Cost of Second Compliance Scenario	**$469.67**	**$304.43**

4.3 Annualized and Per Vehicle, In Use Cost of the Draft Proposed Rule

In this regulatory assessment, staff considered two types of solutions to the debris penetration hazard under the draft proposed rule: i) fully redesigned floorboards that utilize most of the material in original floorboards, and ii) floorboards with floorboard guards. Both scenarios require manufacturers to redesign existing models to allow for proper installation of the floorboard solution of choice. Staff estimated in each scenario the cost of all firms fully deploying that solution solely. Table B.31 below summarizes the aggregate costs of each scenario over the 30-year study period, and their respective present value using a three percent discount rate.

Table B.31: Total 30-Year Cost of Implementing the Draft Proposed Rule

Cost of Debris Penetration Fix ($M)	Cost of Redesigned Floorboard Scenario	Present Value of Redesigned Floorboards Scenario	Cost of Floorboard Guards Scenario	Present Value of Floorboard Guards Scenario
Cost of Redesigning Existing Models	$41.02	$39.24	$38.87	$37.19
Cost of Production of Redesigned Floorboards	$227.09	$142.15	$430.33	$266.94
Deadweight Loss	$0.16	$0.10	$0.47	$0.30
Cost of Compliance	**$268.26**	**$181.49**	**$469.67**	**$304.43**

The total 30-year cost estimates of the ROV/UTV debris penetration compliance are $268.3 million and $469.7 million, for redesigned floorboards or the floorboard guards, respectively. In practice, manufacturers may choose to implement either solution, or a different solution that proves more cost-effective. The corresponding present values for the 30-year cost range is between $181.5 to $304.4 million.

Using the cost estimates from each scenario, staff calculated the annualized cost[68] and the cost per-product. An annualized amount converts the aggregate costs over 30 years into a consistent annual amount while considering the time value of money. This metric is helpful when comparing the costs of different rules or policy alternatives that may have different timelines; or those that have similar timelines, but costs for one are front-loaded while another is backloaded. A per-product metric expresses the cost from the rule per unit of product. This metric is helpful when assessing the impact in marginal terms; for example, comparing benefits to an increase in retail price or marginal increase in cost of production per-unit.

The average annual cost[69] is $8.94 million for the redesigned floorboards scenario and $15.66 million for the floorboard guard scenario. The annualized costs (annual costs using a discount rate for the time value of money) is $9.26 million at a three percent discount rate for the redesigned floorboards scenario and $15.53 million for the floorboard guard scenario.

Staff estimated per-unit cost by dividing the total cost of the scenario (undiscounted and discounted) by the number of ROVs and UTVs in each compliance scenario over the 30-year period. The total number of ROVs & UTVs with the debris penetration fix is 25.12 million in the redesigned floorboard scenario and 25.10 in the floorboard guard[70] scenario. In the redesigned floorboard scenario, the cost per unit is $10.68 undiscounted and $7.23 discounted at 3 percent. In the floorboard guard scenario, the cost per unit is $18.71 undiscounted and $12.13 discounted at three percent.

Table B.32 presents the findings from the cost assessment of this draft proposed rule for both the annualized and per-product perspectives.

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68 CPSC staff converted the aggregate 30-year costs into present values -an amount in today's dollars that is equivalent to the 30-year stream of costs- by discounting all future amounts at a 3% discount rate (a rate that accounts for the time value of money and the opportunity costs). Then, CPSC staff converted these present values into constant annual equivalents, or fixed amounts of cost per year over the 30-year period that represent the constant cost in today's dollars of implementing of the proposed rule.

69 This is the undiscounted total costs of each compliance alternative divided by 30, the number of years in the period of analysis.

70 The total number of ROVs & UTVs is slightly different due to a small difference in the market price impacts of each scenario.

Table B.32: Average Annual Cost of Draft Proposed Rule Under Each Scenario

Cost of Compliance with Proposed Rule	Average Annual Cost - Undiscounted ($M)	Annualized Cost At 3%($M)	Cost per ROV/UTV – Undiscounted ($)	Cost per ROV/UTV – Discounted at 3% ($)
Scenario 1: Redesigning Floorboards	$8.94	$9.26	$10.68	$7.23
Scenario 2: Floorboard Guard	$15.66	$15.53	$18.71	$12.13

5 Benefits and costs analysis

Staff compared estimated benefits and costs to assess the relation between benefits and costs of the draft proposed rule. Table B.33 below displays metrics for both the benefits and costs of the draft proposed rule. It takes the difference and ratio of benefits and costs to assess the cost-benefit relationship.

Table B.33: Net Benefits of Draft Proposed Rule Under Each Scenario

Net Benefits of Proposed Rule – ($M)	Annualized Cost - Redesigned Floorboards	Present Value - Redesigned Floorboards	Annualized Cost - Floorboard Guards	Present Value - Floorboard Guards
Benefits	$15.47	$303.13	$15.47	$303.15
Costs	$9.26	$181.49	$15.53	$304.43
Net Benefits (Benefits – Cost)	$6.21	$121.64	$-0.06	$-1.28
B/C Ratio (Benefits ÷ Cost)	1.67	1.67	1.00	1.00

Finally, Table B.34 compares the benefits and costs of each compliance scenario on a per-vehicle basis to add a marginal value perspective.

Table B.34: Per-Vehicle Net Benefits of Draft Proposed Rule Under Each Scenario

Net Benefits of Proposed Rule - $ per Vehicle	Average Undiscounted - Redesigned Floorboards	Annualized Costs at 3% - Redesigned Floorboards	Average Undiscounted - Floorboard Guards	Annualized Costs at 3% - Floorboard Guards
Benefits	$20.32	$12.07	$20.34	$12.08
Costs	$10.68	$7.23	$18.71	$12.13
Net Benefits (Benefits – Cost)	$9.64	$4.84	$1.63	$-0.05
B/C Ratio (Benefits ÷ Cost)	1.90	1.67	1.09	1.00

5.1 Uncertainty and Sensitivity Analysis

Uncertainty is inherent in any estimate or forecast of future events. This preliminary regulatory analysis estimated future benefits and costs associated with promulgating the draft proposed rule using the best readily available information and data. However, multiple sources of uncertainty may have an impact on the accuracy of the estimates developed for this regulatory assessment:

- A first source of uncertainty is the use of historical data to extrapolate future trends, since it is clearly not certain that the future will follow historical patterns; the farther into the future, the more uncertain is the estimate. Staff applied statistical methods to mitigate this uncertainty to the extent possible.
- A second source of uncertainty is the use of assumptions to overcome the issue of data availability. Staff carefully developed these assumptions based on subject matter expert inputs and literature review; however, they may not perfectly reflect the central trends, nor the full spectrum of possible occurrences in the real world. Staff developed a sensitivity analysis on a few key inputs to mitigate this uncertainty.
- A third source of estimate uncertainty is the omission of certain benefits and costs. For instance, CPSC did not extrapolate the number of incidents to the national level due to the number of recorded incidents of debris penetration being lower than the publication criteria established in NEISS. This may result in a significant under estimation of the benefits of the rule. Likewise, CPSC may have overlooked certain costs of implementing the draft proposed rule. CPSC request comment regarding benefits and costs not addressed in this analysis.

The rest of this section describes the results of a sensitivity analysis on two assumptions used in this preliminary regulatory analysis: (1) the efficacy of the draft proposed rule as a percent of reduction in the number of debris penetration incidents, and (2) the time horizon of the study period. In the preliminary regulatory analysis, staff assumed the proposed rule assumed 100 percent efficacy in preventing debris penetration from compliant vehicles and used a 30-year time horizon for its study period.

Table B.35 presents estimates of benefits and costs at two different levels of efficacy of the proposed rule in reducing the number of incidents. Table B.35 shows that for the redesign floorboard scenario the benefits exceed the costs even at a 60 percent efficacy. In the case of the floorboard guard scenario, the benefits essentially match the cost at a 95 percent efficacy but are lower than the costs when the efficacy of the proposed rule is at 60 percent.

Table B.35: Net Benefit Sensitivity to the Efficacy of the Draft Proposed Rule Under Each Scenario[71]

	Redesigned Floorboards		Floorboard Guards	
Net Benefits ($M)	**95%**	**60%**	**95%**	**60%**
Benefits	$303.13	$191.64	$303.15	$191.64
Costs	($181.49)	($181.49)	($304.43)	($304.43)
Net Benefits	$121.64	$10.14	($1.28)	($112.79)
B/C Ratio	1.67	1.06	1.00	0.63

Table B.36 presents estimates of benefits and costs, and sensitivity of the net benefits to the length of the study period. It compares the 30-year study period used in this regulatory assessment with a 20-year sensitivity test (2024-2043). Table B.36 shows that under the redesigned floorboard scenario, the benefits exceed the cost at both lengths of time. In the case of the floorboard guard scenario, the costs exceed the benefits if the period of analysis is reduced to 20 years.

[71] The small difference in benefits between the redesigned-floorboards and floorboard-guard scenarios is the result of a small but different market price impact in each case. The floorboard-guard scenario is costlier and, therefore, produces a larger price increase that leads to a smaller number of vehicles under the proposed rule, and larger benefits with respect to the baseline situation without the rule.

Table B.36: Net Benefit Sensitivity to the Period of Analysis of the Draft Proposed Rule Under Each Scenario[72]

	Redesigned Floorboards		Floorboard Guards	
Net Benefits ($M)	**30-Year Period**	**20-Year Period**	**30-Year Period**	**20-Year Period**
Benefits	$303.13	$194.37	$303.15	$194.37
Costs	($181.49)	($139.49)	($304.43)	($221.58)
Net Benefits	$121.64	$54.88	($1.28)	($27.21)
B/C Ratio	1.67	1.39	1.00	0.88

6 Staff Evaluation of the Voluntary Standard

In developing the draft proposed rule, staff considered whether the Commission could rely on the current voluntary standard. The current voluntary standards for ROVs/UTVs are:

- ANSI/ROHVA 1-2016 Recreational Off-Highway Vehicles; and
- ANSI/OPEI B71.9-2016—American National Standard for Multipurpose Off-Highway Utility Vehicles.

6.1 ANSI/ROHVA-1

In 2016, the Recreational Off-Highway Vehicle Association (ROHVA) published the latest version of the standard -- ANSI/ROHVA-1 – 2016, *American National Standard for Recreational Off-Highway Vehicles*. The first version of the standard was published in 2010. ROHVA member companies include: Can-AM/BRP, Honda, Deere and Co., Kawasaki, Mahindra, Polaris, Textron Specialized Vehicles (formerly Artic Cat) and Yamaha. Work on ANSI/ROHVA 1 started in 2008, and work completed with publication of ANSI/ROHVA 1-2010. The standard was immediately opened for revision, and a revised standard, ANSI/ROHVA 1-2011, was published in July 2011.

The ANSI/ROHVA-1-2016 standard defines an ROV as an off-highway vehicle with a minimum top speed of 30 mph, no limit on maximum speed, a maximum engine displacement of 1000 cc, and a maximum Gross Vehicle Weight Rating (GVWR) of 3,750 lbs. The standard specifies

[72] The small difference in benefits between the redesigned-floorboards and floorboard-guard scenarios is the result of a small but different market price impact in each case. The floorboard-guard scenario is costlier and, therefore, produces a larger price increase that leads to a smaller number of vehicles under the proposed rule, and larger benefits with respect to the baseline situation without the rule.

requirements for service brakes, parking brakes, and controls specifications for engine, drive train, and steering. Lighting equipment, spark arresters, and warning labels are also covered by the standard.

The ANSI/ROHVA-1-2016 standard has requirements for rollover protective structures (ROPS), lateral stability, vehicle handling, and occupant retention systems that includes seat belts and passive restraints.

The ANSI/ROHVA-1-2016 standard does not have requirements for resistance to debris penetration. The vehicles defined by the ANSI/ROHVA 1- 2016 standard are included in staff's definition of ROVs and are intended to be subject to the requirements that CPSC staff recommends.

6.2 ANSI/OPEI B71.9

In March 2012, Outdoor Power Equipment Institute (OPEI) published the ANSI/OPEI B71.9-2012, *American National Standard for Multipurpose Off-Highway Utility Vehicles*, which is a voluntary standard applicable to ROVs and UTVs. OPEI member companies include: Club Car, Deere and Co., Excel Industries, Honda, Intimidator, Jacobsen, Kawasaki, Kioti, Kubota, Mahindra, MTD, Polaris, Toro, Yanmar, and Yamaha. Work on ANSI/OPEI B71.9 was started in 2008 and completed with the publication of ANSI/OPEI B71.9-2012 in March 2012.

The most recent edition of the OPEI standard was published in 2016 and it provides a definition of "multipurpose off-highway utility vehicles (MOHUVs)," which is very similar to the ROHVA definition of "ROVs." The OPEI definition of MOHUV requires a minimum top speed in excess of 25 mph. The OPEI definition of MOHUV requires a minimum cargo load of 350 lbs. and limits GVWR to 4,000 lbs. The standard specifies requirements for service brakes, parking brakes or mechanism, and vehicle controls. Lighting equipment, spark arresters, and warning labels are also covered by the standard. MOHUVs can be ROVs (those vehicles with top speeds greater than 30 mph) or UTVs (those vehicles with top speeds of less than 30 mph).

The ANSI/OPEI B71.9-2016 standard does not have requirements to guard against the debris penetration risks. The vehicles defined by the ANSI/OPEI B71.9-2016 standard are included in staff's definition of ROVs and UTVs and are intended to be subject to the requirements that staff recommends.

7 Alternatives to the Draft Proposed Rule

Staff considered three alternatives to the draft proposed rule: (1) Conduct marketing campaigns and recalls instead of promulgating a final rule; (2) rely on voluntary standards development; and (3) limit ROV and UTV speed to a maximum of 10 miles per hour. Staff does not recommend these alternatives for the following reasons:

7.1 Conduct Marketing Campaigns and Recalls Instead of Promulgating a Final Rule

The Commission could issue news releases or utilize other information and marketing techniques to warn consumers about debris-penetration hazards associated with ROVs and UTVs instead of issuing a mandatory rule. With this alternative, most vehicles would comply with one of the two voluntary ROV standards, and ROV and UTV manufacturers would incur no costs to modify or test their vehicles to comply with the draft proposed rule. However, neither voluntary standard includes a performance standard requirement to prevent debris penetration into the occupant area.

Information and marketing campaigns, may reduce the number of injuries and societal costs associated with ROV/UTV debris penetration hazard. ROV/UTV users aware of debris penetration hazard may modify their behavior, drive more alertly, reduce driving speed, and avoid debris when possible. However, given that encountering debris in an off-highway environment is largely unavoidable and that debris penetration is possible at speeds as low as 2 mph, information and marketing campaigns are unlikely to substantially reduce risk of injury.

Recalls only apply to an individual manufacturer and product, do not extend to similar products, and occur only after consumers have purchased and used such products and have been exposed to and potentially injured or killed by the hazard. Additionally, recalls can only address products that are already on the market and cannot prevent unsafe products from entering the market.

Therefore, much of the estimated $18.02 million annualized societal costs would continue to be incurred by consumers in the form of deaths and injuries. For this reason, staff does not recommend this alternative.

7.2 Rely on voluntary standards development

The Commission could direct staff to work with voluntary standards development organizations to address the hazard. This alternative would allow ROHVA and OPEI member firms to collectively determine the degree, manner, and timing of debris penetration hazard mitigation which could delay or reduce costs incurred by these firms to address the hazard. ROHVA and

OPEI member firms supplied approximately 95% of the ROVs and UTVs sold in the U.S. in 2019. Non-member firms may choose not to comply with ROHVA and OPEI voluntary standards and therefore incur no associated costs. However, staff has been discussing debris penetration hazards with ROHVA and OPEI since 2018 without them making progress on standard development to adequately address this hazard pattern. Staff will continue to work with ROHVA and OPEI on voluntary standards but do not know if or when a standard will be developed to adequately address this hazard. Until such voluntary standards are developed, staff expects the number and societal costs of injuries and fatalities associated with debris penetration hazard to remain at or near current levels. Therefore, staff does not recommend this alternative.

7.3 Limiting ROV and UTV Speed to a Maximum of 10 Miles per Hour

In making its recommendation regarding this alternative, staff weighed both quantifiable factors and unquantifiable factors. If the Commission promulgated a rule limiting ROV and UTV speed to a maximum of 10 miles per hour, staff expects benefits, in the form of reduced societal costs, to be substantially less than that of the draft proposed rule, as testing conducted by SEA Ltd. indicated many ROVs and UTVs are subject to debris penetration into the occupant area at speeds less than 10 mile per hour. Therefore, while staff would expect costs to manufacturers to be less, quantifiable net benefits would be less as well. In addition, setting the maximum speed at 10 mph could have a negative impact on consumer acceptance of the requirement and result in costs including time, inconvenience, and reduced consumer satisfaction, leading to substantial lost consumer surplus and utility of the product. Considering both the quantifiable and unquantifiable costs and benefits, staff determined that the net benefit of this alternative is less than that of the draft proposed rule. Therefore, staff does not recommend this alternative.

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TAB C

Draft Proposed Rule for Mitigating the Debris Penetration Hazards Associated with Recreational Off-Highway Vehicles and Utility Task/Terrain Vehicles: Initial Regulatory Flexibility Analysis

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April 6, 2022

I. Background

The Consumer Product Safety Commission (CPSC or Commission) is considering a proposed rule to establish a performance standard performance standard to prevent debris penetration hazard associated with recreational off-highway vehicles (ROVs) and utility task/terrain vehicles (UTVs). CPSC staff initiated this rulemaking on May 11, 2021, with the publication of an advance notice of proposed rulemaking (ANPR) in the *Federal Register*. Whenever an agency publishes a notice of proposed rulemaking (NPR), Section 603 of the Regulatory Flexibility Act (RFA), 5 USC 601–612, requires agencies to prepare an initial regulatory flexibility analysis (IRFA) unless the head of the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. The IRFA or a summary of it must be published in the Federal Register with the proposed rule. Under Section 603(b) of the RFA, each IRFA must address:

> (1) a description of why action by the agency is being considered;
>
> (2) a succinct statement of the objectives of, and legal basis for, the proposed rule;
>
> (3) a description of and, where feasible, an estimate of the number of small entities to which the proposed rule will apply;
>
> (4) a description of the projected reporting, recordkeeping, and other compliance requirements of the proposed rule, including an estimate of the classes of small entities which will be subject to the requirement and the type of professional skills necessary for preparation of the report or record; and
>
> (5) an identification to the extent practicable, of all relevant Federal rules which may duplicate, overlap, or conflict with the proposed rule.

The IRFA must also describe any significant alternatives to the proposed rule that would accomplish the stated objectives and that minimize any significant economic impact on small entities.

II. Discussion

A. Reason for Agency Action

The intent of this rulemaking is to reduce deaths and injuries resulting from the debris penetration into the occupant area of ROVs and UTVs. CPSC staff identified six fatal injuries and 22 non-fatal injuries associated with the debris penetration hazard from 2010 through 2021. In 2021, CPSC staff contracted with SEA Limited (SEA) to conduct testing related to the ROV and UTV debris penetration hazard. The SEA tests indicate that at least some ROVs and UTVs on the market have hazardous characteristics that could be addressed through a mandatory performance safety standard to mitigate the hazards of debris penetration. The Commission is considering this proposed rule because the two voluntary standards, ANSI/ROHVA-1-2016 *American National Standard for Recreational Off-Highway Vehicles* and ANSI/OPEI B71.9-2016 *American National Standard for Multipurpose Off-Highway Utility Vehicles*, for ROVs and UTVs do not address debris penetration.

B. Objectives of and Legal Basis for the Rule

The Commission proposes this rule to reduce the risk of death and injury associated with debris penetration into the occupant area of ROVs and UTVs. CPSC staff initiated this rulemaking on May 11, 2021, with the publication of an advance notice of proposed rulemaking (ANPR) in the *Federal Register*. The rule is promulgated under the authority of the Consumer Product Safety Act (CPSA).

C. Small Entities to Which the Rule Will Apply

The proposed rule would apply to all manufacturers and importers of ROVs and UTVs. ROV and UTV manufacturers may be classified in the North American Industrial Classification (NAICS) category 336999 (All Other Transportation Equipment Manufacturing), or possibly, 336112 (Light Truck and Utility Vehicle Manufacturing). The Small Business Administration (SBA) size standard for these NAICS classifications are 1,000 employees and 1,500 employees, respectively. Of the 35 identified ROV and UTV manufacturers, staff identified seven (20 percent of U.S. ROV and UTV manufacturers) with fewer than 1,500 employees, that therefore meet the SBA threshold for small business.

Importers of ROVs and UTVs could be wholesale or retail distributers. ROV and UTV wholesalers may be classified in NAICS categories 423110 (Automobile and Other Motor Vehicle Merchant Wholesalers) or 441228 (Motorcycle, ATV, and All Other Motor Vehicle Dealers). The SBA size standard for NAICS classification 423110 is 250 employees. The SBA size standard for NAICS classification 441228 is $35 million. Of the 48 identified distributers/brands, of which 26 may be foreign importers, staff identified 19 firms (39.6 percent of distributer/brands) distributing foreign manufactured (primarily Chinese) ROVs and UTVs in 2019 that could be considered small businesses.[1]

D. Compliance, Reporting, and Record Keeping Requirements of Proposed Rule

The proposed rule would establish a performance requirement for ROVs and UTVs and a test procedure that suppliers would have to meet to sell in the United States. The proposed rule requires there be no debris penetration in the occupant area of a test vehicle or simulated vehicle sled that is propelled at 10 mph onto a stationary dowel.

In 2021, CPSC staff contracted SEA to conduct testing related to the ROV and UTV debris penetration hazard. SEA tested a small non-representative sample of ROV and UTV models with, and without, after-market guards. None of the models met the performance requirements of the proposed rule when without aftermarket guards. Therefore, CPSC staff expects most small (and large) ROV and UTV manufacturers would incur costs associated with bringing their vehicles into compliance with the proposed rule, as well as costs related to testing and issuance of a general certificate of conformity (GCC).

In accordance with Section 14 of the CPSA, manufacturers would have to issue a GCC for each ROV and UTV model, certifying that the model complies with the proposed rule. According to Section 14 of CPSA, GCCs must be based on a test of each product or a reasonable testing program; and GCCs must be provided to all distributors or retailers of the product. The manufacturer would have to comply with 16 CFR part 1110 concerning the content of the GCC, retention of the associated records, and any other applicable requirement.

E. Federal Rules that May Duplicate, Overlap, or Conflict with the Proposed Rule

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[1] EC Staff made these determinations using information from Dun & Bradstreet and ReferenceUSAGov.

At the time of this document, no other Federal rules duplicate, overlap, or conflict with the proposed rule.

F. Potential Impact on Small Entities

One purpose of the IRFA is to evaluate the impact of a regulatory action to small entities and to determine whether that impact is economically significant. While the SBA allows considerable flexibility in determining "economically significant," CPSC staff typically uses one percent of gross revenue as the threshold for determining "economically significant." When CPSC staff cannot demonstrate that the impact is lower than one percent of gross revenue, staff prepares an initial regulatory flexibility analysis.[2]

1. Impact on Small Manufacturers

The preliminary regulatory analysis (Tab B) discusses costs more fully. Based on that analysis, to achieve compliance with the proposed rule's performance requirements, ROVs and UTVs suppliers would incur costs from redesigning, retooling, and testing. Staff estimated this cost to be $51,050 per model in the first year.[3] This figure includes $9,361 in testing costs per model. Staff estimated the additional production cost for labor and material to be $29.23 per vehicle produced in the first year. Staff does not anticipate new reporting or recordkeeping requirements from this rule.

Staff identified seven ROV and UTV manufacturers which meet SBA size standards for small businesses. Staff applied both the per-model and per-vehicle costs to each manufacturers' number of models and unit sales in 2019. Staff found the initial cost to comply with the proposed rule exceeds one percent of reported annual revenue for five of the seven manufacturers identified as small businesses. For these five ROV and UTV manufacturers, the economic impact of the proposed rule is expected to be significant.

[2] The one percent of gross revenue threshold is cited as example criteria by the SBA and is commonly used by agencies in determining economic significance (see U.S. Small Business Administration, Office of Advocacy. *A Guide for Government Agencies: How to Comply with the Regulatory Flexibility Act and Implementing the President's Small Business Agenda and Executive Order 13272*. May 2012, pp 18-20. http://www.sba.gov/sites/default/files/rfaguide_0512_0.pdf)

[3] Testing may be performed by the manufacturer by third party engineering consulting or testing firms.

2. Impact on Small Importers

Staff identified 14 possible importers of ROVs and UTVs from foreign suppliers that would be considered small businesses based on SBA size standards. Staff identified an additional five importers for which a size determination could not be made but which are likely small based on number of models and units sold. A small importer would be adversely impacted by the proposed rule if its foreign supplier withdrew from the U.S. market rather than incur the cost of compliance. Importers would also be adversely impacted if foreign manufacturer failed to provide a GCC and have to perform its own testing for compliance. If sales of ROVs and UTVs are a substantial source of the importer's business, and the importer cannot find an alternative supplier of ROVs and UTVs, the economic impact on these firms may be significant. However, the U.S. ROV and UTV market has grown at annual rate of 13.5 percent since 1998; it is unlikely that foreign manufacturers would exit such a fast-growing market. ROV and UTV importers also import other products such as scooters, motorcycles, and other powersport equipment. For these firms, any decline in ROV and UTV sales and revenue may be partially or fully offset by increasing sales and revenues in these other products.

Small importers would be responsible for issuing a GCC certifying that their ROVs and UTVs comply with the rule's requirements. However, importers may issue GCCs based upon certifications provided by or testing performed by their suppliers. The impact on small importers whose suppliers provide GCCs should not be significant. If a small importer's supplier does not provide the GCC or testing reports, then the importer would have to certify each model for conformity based on a reasonable testing program. Importers would likely contract with an engineering consulting or testing firm to conduct the certification tests. As discussed in the regulatory analysis, staff estimated certification testing to be $9,361 per model. This would exceed one percent of the revenue for 13 of the estimated 19 identified small importers, assuming these firms continue to import the same mix of products as in the pre-regulatory environment.

G. Alternatives for Reducing the Adverse Impact on Small Businesses

Staff considered several alternatives to the proposed rule. These include: (1) conduct marketing campaigns and recalls instead of promulgating a final rule; (2) rely on voluntary standards development; and (3) limit ROV and UTV speed to a maximum of 10 miles per hour. CPSC staff does not recommend these alternatives for the following reasons:

1. Conduct Marketing Campaigns and Recalls Instead of Promulgating a Mandatory Rule

The Commission could issue news releases or utilize other information and marketing techniques to warn consumers about debris-penetration hazards associated with ROVs and UTVs instead of issuing a mandatory rule. With this alternative, most vehicles would comply with one of the two voluntary ROV standards, and ROV and UTV manufacturers would incur no costs to modify or test their vehicles to comply with the draft proposed rule. However, neither voluntary standard includes a performance standard requirement to prevent debris penetration into the occupant area.

Information and marketing campaigns may reduce the number of injuries and societal costs associated with ROV/UTV debris penetration hazard. ROV/UTV users aware of debris penetration hazard may modify their behavior, drive more alertly, reduce driving speed, and avoid debris when possible. However, given that encountering debris in an off-highway environment is largely unavoidable and that debris penetration is possible at speeds as low as two mph, information and marketing campaigns are unlikely to substantially reduce risk of injury.

Recalls only apply to an individual manufacturer and product, do not extend to similar products, and occur only after consumers have purchased and used such products and have been exposed to and potentially injured or killed by the hazard. Additionally, recalls can only address products that are already on the market and cannot prevent unsafe products from entering the market.

Therefore, much of the estimated $18.02 million annualized societal costs would continue to be incurred by consumers in the form of deaths and injuries. For this reason, staff does not recommend this alternative.

2. Rely on Voluntary Standards Development

The Commission could direct staff to work with voluntary standards development organizations to address the hazard. This alternative would allow ROHVA and OPEI member firms to collectively determine the degree, manner, and timing of debris penetration hazard mitigation, which could delay or reduce costs incurred by these firms to address the hazard. Non-member firms may choose not to comply with ROHVA and OPEI voluntary standards and therefore incur no associated costs. Staff identified one small manufacturer that is an OPEI member; all other identified small firms are non-members. These small, non-member firms supplied approximately

3.4 percent of the OHVs and UTVs sold in the U.S. in 2019. However, staff has been discussing debris penetration hazards with ROHVA and OPEI since 2018 without them making progress on standard development to adequately address this hazard pattern. Staff will continue to work with ROHVA and OPEI on voluntary standards but do not know if or when a standard will be developed to adequately address this hazard. Until such voluntary standards are developed, staff expects the number and societal costs of injuries associated with debris penetration hazard to remain at or near current levels. Therefore, staff does not recommend this alternative.

3. Limiting ROV and UTV Speed to a Maximum of 10 Miles per Hour

In making its recommendation regarding this alternative, CPSC staff weighed both quantifiable factors and unquantifiable factors. If the Commission promulgating a rule limiting ROV and UTV speed to a maximum of 10 miles per hour, CPSC staff expects benefits, in the form of reduced societal costs, to be substantially less than that of the proposed rule, as testing conducted by SEA Ltd. indicated many ROVs and UTVs are subject to debris penetration into the occupant area at speeds less than 10 mile per hour. Therefore, while staff also expects costs to manufacturers to be less, quantifiable net benefits are expected to be greater. In addition, staff believes that setting the maximum speed at 10 mph could have a negative impact on consumer acceptance of the requirement and result in unquantifiable costs including time, inconvenience, and reduced consumer satisfaction, leading to substantial lost consumer surplus and utility of the product. Considering both the quantifiable and unquantifiable costs and benefits, staff determined that the net benefit of this alternative is less than that of the proposed rule. Therefore, staff does not recommend this alternative.

4. Small Batch Exemption

The Commission could exclude firms which produce or import small numbers of ROVs and/or UTVs from the proposed rule's performance requirements. In this case, most small businesses would not suffer adverse economic impacts. Small manufacturers supplied approximately 1.3 percent of ROVs and UTVs sold in the U.S. in 2019. Small distributers of foreign-manufactured ROVs and UTVs accounted for 2.4 percent of U.S. sales in 2019. Combined, small businesses comprised approximately 3.7 percent of the 2019 U.S. ROV and UTV market. CPSC staff is not aware of any fatal or non-fatal debris penetration related injuries associated with ROVs and UTVs manufactured or imported by small firms. However, staff is unaware of any engineering differences between vehicles manufactured by small manufacturers versus large ones, and there is no data to suggest that the risk of injury posed by vehicles manufactured or supplied by small businesses is any different than the risk posed by vehicles manufactured or supplied by large firms. Based on this, staff does not recommend adopting a small batch exemption.

H. Conclusion

Staff identified seven manufacturers that meet the SBA criteria to considered small firms. For five of these firms, the estimated cost from the proposed rule exceeds one per percent of annual revenue. Staff assess the proposed rule would have a significant economic impact on these five firms.

Staff estimated that there are 19 importers of foreign manufactured ROVs and UTVs that meet the SBA criteria to be considered small. A small importer whose supplier exits the market or does not provide the importer a GCC could experience a significant adverse economic impact. However, given the fast-growing market, staff does not anticipate foreign manufacturers to exit the U.S. market, and further, staff assumes that foreign manufacturers would provide certifications that small importers could rely on, so that these foreign manufacturers could preserve their sales. Given that assumption, staff assesses no significant economic impact on the importers ROVs and UTVs.

In summary, the proposed rule is likely to have a significant adverse economic impact on five of the seven identified small manufacturers but unlikely to have a significant direct impact on the 19 small importers of ROVs and UTVs.

The Commission welcomes public comments on this IRFA. Small businesses that believe they would be affected by the proposed rule are encouraged to submit comments. The comments should be specific and describe the potential impact, magnitude, and alternatives that could reduce the impact of the proposed rule on small businesses.

TAB D

United States
Consumer Product Safety Commission

Memorandum

TO:	Han Lim Off-Highway Vehicles Project Manager Division of Mechanical and Combustion Engineering Directorate for Engineering Sciences	**DATE:** 01/05/2022
THROUGH:	Risana Chowdhury Director, Division of Hazard Analysis Directorate for Epidemiology	
FROM:	Chao Zhang Division of Hazard Analysis Directorate for Epidemiology	
SUBJECT:	Review of Incidents, Injuries, and Fatalities Associated with Off-Highway Vehicle (OHV) Debris Penetration Hazards	

I. INTRODUCTION

The U.S. Consumer Product Safety Commission (CPSC) staff prepared this review in its consideration of regulatory action to address debris penetration hazards on off-highway vehicles (OHVs). All-terrain vehicles (ATVs), recreational off-highway vehicles (ROVs), and utility terrain vehicles or utility task vehicles (UTVs) comprise OHVs, although no ATVs were found to be represented in the data analyzed. This review presents information on OHV-related deaths, injuries, and non-injury incidents. The National Electronic Injury Surveillance System (NEISS) – based injury estimates are from January 1, 2009 to December 31, 2020; finalized NEISS data for 2021 will be available in Spring 2022. The reported incidents from CPSC's Consumer Product Safety Risk Management System (CPSRMS) are from January 1, 2009 through December 31, 2021. Data collection is ongoing in CPSRMS and reporting is considered incomplete for the latest three years.[1] In addition, for the hazard reviewed in this memorandum, the NEISS data were insufficient for staff to derive injury estimates.[2] As such, injury cases from NEISS are combined with CPSRMS incident reports in the analysis that follows.

II. RESULTS

Between 2009 and 2021, there were a total of 107 incidents found in CPSC databases involving debris penetration hazards; 104 of these incidents were found in CPSRMS, and 3 injury cases in NEISS. A previous search conducted for the Advance Notice of Proposed Rulemaking (ANPR) completed in Spring 2021 returned 105 total incidents involving debris penetration hazards, consisting of 103 CPSRMS incidents and 2 NEISS injury cases. Additionally, while the ANPR memorandum analyzed both debris penetration and fire hazards, this current Notice of Proposed Rulemaking (NPR) memorandum covers only debris penetration hazards.

Debris penetration involves debris (usually a tree branch or stick) penetrating an OHV (usually the floorboard of the underside of an ROV or UTV). When such penetration occurs, there is a potential hazard for the branch or other debris to penetrate far enough to harm occupants of the ROV or UTV. None of the incidents staff identified were found to involve ATV debris penetrations incidents (other than an ROV mischaracterized as an "ATV"). Given that ATVs lack floorboards, this result was not unexpected, but staff did search all OHV incidents for this hazard regardless of whether the narrative mentioned an ATV, ROV, UTV, or an unknown type of OHV. Additionally, although some incident narratives may identify the product involved as a UTV, it is possible that the actual product involved was a ROV (since ROVs are included in the product code for UTVs), given brand/model information.

In the NEISS data, staff identified only three cases with sufficient descriptive information to conclude that the injuries were specifically associated with the debris penetration hazard. Due to this small sample size, staff cannot report any estimate of injuries.[2] Instead, for the debris penetration hazard scenario, staff counted the three injuries from NEISS with the other reported injuries from CPSRMS.

[1] The most recent search of both CPSRMS and NEISS was conducted on January 5, 2022. Product codes searched were 3285 (Off-road 3-wheel ATVs), 3286 (4-wheel ATVs), 3287 (ATVs where number of wheels is unspecified), 3296 (ATVs with more than 4 wheels), and 5044 (Utility Vehicles).

[2] According to the NEISS publication criteria, an estimate must be 1,200 or greater, the sample size must be 20 or greater, and the coefficient of variation must be 33 percent or smaller.

Table 1 shows the yearly breakout of debris penetration hazards by data sources and severity of incidents.

Table 1: Reported Incidents of OHV Debris Penetration Hazards by Year (CPSRMS: 2009-2021, NEISS: 2009-2020)

Year	Total Incidents	Fatal Reported Incidents	Injury Reported Incidents	Non-Injury Incidents
Total	**107**	**6**	**22**	**79**
2009	1	0	1	0
2010	4	1	1	2
2011	3	0	1	2
2012	7	0	0	7
2013	8	0	2	6
2014	11	1	1	9
2015	8	1	3	4
2016	30	0	5	25
2017	27	2	2	23
2018	5	0	4	1
2019*	2	1	1	0
2020*	0	0	0	0
2021*	1	0	1	0

Sources: CPSRMS and NEISS.
*Data collection is ongoing.

Many of the 104 debris penetration incidents found in CPSRMS include multiple people riding in the OHV. However, for reports involving non-fatal injuries, only the age and/or gender of one or two of the victims is recorded. In reports received from manufacturers and retailers, which largely consist of non-injury incidents, basic victim demographic information is frequently not included at all.

Table 2 presents a broad overview of the distribution of the 107 debris penetration incidents by primary victims' age and gender. Forty-four of the 47* incidents with victim age missing are non-injury incidents; all 36** incidents with both victim age and gender missing are non-injury incidents as well.

Table 2: Reported Incidents of Debris Penetration Hazards by Age and Gender

	Female	Male	Gender Missing	Total
0 – 17 years	2	6	0	**8**
18 – 34 years	4	11	0	**15**
35 – 54 years	9	17	0	**26**
55+ years	0	11	0	**11**

Age Missing	1	10	36	**47***
Total	**16**	**55**	**36****	**107**

Sources: CPSRMS and NEISS.
*Age missing; **Both age and gender missing.

In all six fatal incidents, it appears only one victim died per incident, as opposed to multiple fatalities per incident. Two involve death of a passenger, while the other four involve death of the driver. Four involved a tree branch, one a large stick, and one a 2 to 3-inch piece of wood. At least three involved penetration of the chest.

The six fatal incidents were followed up through in-depth investigations by CPSC Field staff. Paraphrasing the text written by the respective CPSC investigators for each of the six fatal incidents, the incident scenarios are as follows:

- **tree limb** penetrated the floor board and struck 28-year old male **passenger** in ***chest*** (driven in water)

- tire over **tree limb** which pierces fender, nylon mesh door, and left side of 42-year old female **driver** (driven in woods)

- passed over a **large stick** that was sticking up in the ground which passed through brake pedal arm through bottom edge of seat and into ***lower abdomen*** of 55-year old male **driver** (driven in power line clearing)

- Impaled by a **2 to 3-inch size piece of wood** in ***upper right thigh*** causing exsanguination of 26-year old female **driver** (driven on heavily forested public land)

- **Branch** penetrated UTV bottom and struck 52-year old female **passenger** in ***chest*** (driven along trail)

- ran over **large tree branch** which struck 22-year old male **driver** in ***chest*** (driven in mountains)

In addition to these six fatal incidents, there was another fatal incident found where a male driver was driving a UTV in a state forest and struck a downed tree, which penetrated the windshield and impaled the driver in the chest. However, there were conflicting reports regarding the nature of the debris penetration; some reports indicated damage to the underside of the UTV. As the scope of this NPR does not include debris penetration hazards to OHV windshields, and the extent of debris penetration damage to the underside of the UTV is unclear, this incident is not included in this analysis.

The severity of the 22 non-fatal injury incidents due to debris penetration is presented in Table 3. The injuries ranged from mostly minor cuts, bruises and/or abrasions to more severe injuries like broken bones or debris impalement in the body. Most of the non-fatal injuries occurred in the lower area of the body (ankles, legs, foot, etc.) or abdomen.

Table 3: Reported Incidents of Debris Penetration Hazards by Injury Severity (2009-2020 NEISS, 2009-2021 CPSRMS)

Injury Severity	Incidents
Treated and Released, or Released without Treatment	2
Hospital Admission	4
Emergency Department Treatment Received	3
First Aid Received by Non-Medical Professional	1
No First Aid or Medical Attention Received	2
Level of care not known	10
Total Injury Incidents	22

Source: CPSRMS and NEISS.

TAB E

United States
Consumer Product Safety Commission
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Memorandum

TO: Han Lim, Mechanical Engineer
Division of Mechanical and Combustion Engineering
Directorate for Engineering Sciences

DATE: March 1, 2022

FROM: Blake Rose, Division Director
Resources Management Division
Office of Compliance and Field Operations

SUBJECT: Off-Highway Vehicle (OHV) Debris Penetration Recalls

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BACKGROUND:

To support rulemaking to address debris penetration hazards associated with Off-Highway Vehicles (OHVs), the Office of Compliance and Field Operations (EXC) staff prepared this memorandum that provides CPSC recall data.

RECALL HISTORY:

Recall Number	Recall Date	Number of Affected Vehicles	Number of Injuries	Number of Incidents*	Hazard per the Description on the CPSC webpage
14-741	7/30/2014	11,000	2	4	The vehicle's floor boards can allow a stick or other debris to break through and protrude into the foot rest area, posing an injury hazard to the operator and front passenger
16-714	12/15/2015	19,500	8	628	Sticks or other debris can break through the vehicle's floor board and protrude into the foot rest area, posing an injury hazard to the operator and front passenger.
16-221	7/7/2016	25,000	1	2	The front floor cover can be punctured by a foreign object, posing an injury hazard to riders.

* The 2015 recall was an expansion of the 2014 recall and included additional ROV models; the division of the numbers of reported incidents between the two recalls is approximate.

CPSC RECALL DATA:

There have been no recalls of OHVs involving a debris penetration hazard since the May 2021 ANPR.