DANGER ON R

The fleet of RVs, campers, and other modified vehicles on the road is growing, and these vehicles present problems that differ from those of regular cars and trucks. Many contain design and manufacturing defects that can injure their occupants.

By || **J. Kent Emison and Brett A. Emison**

Recreational vehicles (RVs), camping trailers, and conversion vans comprise a large segment of what are known as incomplete, aftermarket, or modified vehicles. According to industry research, more than 1 in 12 vehicle-owning families owned an RV in 2012.[1] Annual RV sales now total $12 billion, and RV rentals account for $191 million a year.[2]

With the use of these vehicles on the rise, litigation over design and manufacturing defects will increase as well. Plaintiff lawyers must be prepared to identify and prove defects in these and other modified vehicles, including limousines, handicapped-accessible vehicles, and ambulances.

State law pertaining to these vehicles varies greatly. However, some manufacturers may be subject to uniform industry standards through membership in the Recreation Vehicle Industry Association (RVIA) or the Recreational Park Trailer Industry Association.[3] These associations provide labels for recreational vehicle manufacturers that include certifying that the vehicles meet industry standards. The

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National Fire Prevention Association (NFPA) also has established standards applicable to recreational vehicles.[4]

In litigating RV, trailer, and camper cases, the technical definition of a recreational vehicle may come into question. If the RV's width is 8.5 feet or less and interior space is less than 320 square feet, it is classified as a "travel trailer" regulated by NFPA Standard 1192. Units built to this standard by members of the RVIA must be labeled with the RVIA's seal. If the unit can be driven on the highway, it's a motor home regulated by the U.S. Department of Transportation and the National Highway Traffic Safety Administration, regardless of its size.[5]

RVIA standards also set out requirements for electrical, fuel, and plumbing systems. They include:

- ground fault protected receptacles where they are appropriate
- allowing only listed electrical fixtures, appliances, equipment, and materials that have been labeled by nationally recognized testing agencies
- dielectric tests (high-voltage tests to measure the margin of safety for the electrical system) to be performed on the completed RV to determine whether the system is installed correctly.[6]

Identifying Potential Defects

Product defects may stem from the incomplete vehicle manufacturer (which supplies the chassis), the final-stage manufacturer (which transforms the chassis into a finished vehicle), or another manufacturer involved elsewhere in the process.

RVs must protect occupants in the event of a collision the same way cars should because they are designed for use on and around America's highways and roadways. It is not unusual to see these vehicles on a back road or cruising down an interstate at up to 80 mph.

Because RVs are "homes on wheels," they are also subject to many non-crash-related dangers not found in other vehicles. For example, they house generators, propane tanks, and appliances.

Crashworthiness. Recreational vehicles pose crashworthiness issues that are similar to those of traditional passenger

vehicles, but with greater complexity and typically without sufficient documentation or testing. Crashworthiness and automotive defects include:

- Post-collision fire. RVs should not catch fire in an otherwise survivable collision. Manufacturers must protect the fuel and propane systems against collisions that occupants would otherwise survive.
- Restraint systems. RVs should provide adequate air bag and seat belt systems to protect drivers in accidents or crashes at highway speeds.
- Stability and tires. RVs must be sufficiently stable to permit the driver to control the vehicle in the event of a blowout or tire de-tread. The vehicle may have inadequate stability control. Tires must be designed and manufactured to withstand the rigors of highway driving under loads produced by RVs.[7]

Like RVs, conversion and handicapped-accessible vans are multistage vehicles and subject to similar problems in their design and manufacture. In one case we handled, a man burned to death when his handicapped-accessible van accelerated out of control and crashed, and a fuel-fed fire ignited several minutes after the collision.[8] There were two primary defects. First, the hand-activated accelerator controls were defective. The electronics were not sufficiently sealed to prevent moisture and liquids from entering. This defect caused a pattern of sudden unintended acceleration that was never properly remedied.

Second, the end-stage manufacturer had relocated the fuel tank behind the rear axle to accommodate a wheelchair lift. In doing so, the manufacturer added fuel filler tube, which it routed without protection along the body panels, through jagged cuts in the sheet metal, and through the rear wheel well. When the vehicle crashed, the extended fuel line ruptured and the man burned to death while trapped inside the van.

When deposing the final-stage manufacturer's corporate representative, we learned the company had no blueprints for the modifications and no engineer on staff. The company did not retain an engineer to review the modifications, and it never tested them for safety or crash performance. The throttle component manufacturer also failed to test the accelerator components and failed to perform any failure mode and effects analysis (FMEA).

Other crash-related defects may include improper welds or other metallurgical defects, failure to protect occupant survival space with robust materials, and seat or seat back defects. Also, courts have addressed defects such as bumper compatibility and underride (meaning large vehicles like semi-trucks and RVs with high clearance should have underride protection to prevent vehicles from intruding beneath the vehicle in a collision), sudden acceleration, and defective gear selectors.[9]

Structural problems. In RVs, structural robustness competes with lightweight and cost-effective materials. Inadequate vehicle structures, including inadequate sidewall and roof strength, can have devastating effects on passengers during a collision. Lightweight structural material may not protect passengers or may cause passenger ejection or other injuries in a collision.

In one case, a man was killed when an ambulance overturned and essentially disintegrated. The "box" structure housing the patient and medical personnel was not structurally robust and fell apart around the occupants during the accident. The manufacturer never tested the structure to determine whether it would survive a collision.[10]

Structural problems unrelated to collisions may involve the vehicle's roof or other components such as the axle.[11]

Propane system. An expert on fire cause and origin is critical when investigating a potential propane system defect. Causes of propane explosions and fire include failure to adequately protect or shield the propane tank in the event of a collision; improper propane tank installation; improper propane line routing, resulting in kinks or pinches; cuts, cracks, holes, wear, or other compromise in propane lines; inadequate or missing safety devices in propane-using appliances or accessories; and inadequate or missing propane odorization. In propane odorization, a strong-smelling chemical malodorant is added to propane. This provides a method of detection in case there is a leak. Ethyl mercaptan is a chemical that is often used for odorization because it is chemically stable when it's mixed with propane. If ethyl mercaptan's odor is detected, propane vapors are likely present.

In one case involving a woman who was killed in an RV propane explosion, our fire cause and origin expert identified a kinked or crimped propane line and small hole that permitted propane gas to escape into the RV. After finding the source of the explosion, we had to identify why the crimp and hole were created and not remedied during the manufacturing process.

After inspecting the manufacturing plant and deposing several employees, we learned that there were no blueprints for workers to follow when assembling the final-stage RV. Workers building the RVs were paid bonuses for the quantity of vehicles produced, while the quality of work went uninspected. No one at the final-stage manufacturer even attempted an FMEA to prevent injuries or evaluate the vehicles' safety.[12]

Carbon monoxide. Carbon monoxide is an odorless, colorless gas that is toxic and is the number-one cause of accidental poisoning deaths in the United States.[13] RV users live and sleep in close proximity to carbon monoxide

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sources such as the vehicle's engine (or tow vehicle's engine), gasoline-powered generator, and propane- or other fuel-burning appliances.

Potential carbon monoxide defects include failure to install adequate, operational carbon monoxide detectors and alarms; properly seal carbon monoxide sources; properly seal the vehicle's floor, sidewalls, windows, and doors[14]; and properly ventilate carbon monoxide sources.

For example, we represented the survivors of an entire family killed by carbon monoxide in a camper trailer. The family was involved in local auto racing and purchased a combination trailer that both carried their racecar and provided living quarters while at the track. In addition to proving the carbon monoxide defect, we also had to prove that the trailer was not merely a vehicle hauler but also intended to be a camper. The trailer manufacturer argued that carbon monoxide protections were not required even though the trailer included sleeping and eating quarters. We were able to prove that the trailer was intended for use as a camper and the manufacturer failed to seal out sources of carbon monoxide and provide adequate carbon monoxide warning systems.[15]

Fire and other safety issues. Because of their size and potentially complex layout, RVs pose unique issues. Every RV has numerous sources of fire and flame, so vehicles must have precautions in place, such as fire-retardant materials to prevent the rapid spread of fire through the passenger compartment. Safety defects include

- inadequate smoke detectors, fire extinguishers, carbon monoxide detectors, and propane gas detectors
- inadequate exit facilities providing unobstructed egress from the vehicle in an emergency
- noncompliance with the NFPA's standards on interior materials' propensity to spread flames in the event of fire
- unsafe electronics or electrical wiring[16]
- gas leaks[17] or excessive levels of formaldehyde gas[18]
- failure to adequately warn or instruct RV users on safe use of retractable slide-out rooms to avoid injuries or death when retracting the slide-out.[19]

Building Your Case

Whether the case involves crash-related defects or other defects, you must investigate the design and manufacturing procedures for the vehicle at issue. Many of the federal minimum

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standards applicable to passenger cars and trucks do not apply to RVs, campers, trailers, and conversion vans. If the modified vehicle is manufactured from an incomplete vehicle chassis, it may never be crash-tested in its final, manufactured configuration.

Despite government and industry standards that may apply, many manufacturers fail to adhere to basic fundamental engineering practices in designing and manufacturing these vehicles. Many manufacturers do not have standardized plans or blueprints, do not employ a licensed professional engineer to review blueprints or troubleshoot design or manufacturing issues, and do not have a safety department to ensure design and testing compliance.

Few RV manufacturers undertake rigorous FMEAs to identify potential defects and failure modes before the vehicle reaches the consumer. A uniform FMEA for both design and the manufacturing and assembly process is available through SAE International Standard J1739.[20]

An effective FMEA identifies both known and potential failure modes, as well as their causes and effects. It should prioritize identified failure modes according to the risk priority number, which is the product of the frequency of occurrence, severity, and ability to detect the failure before it reaches the consumer. It is not enough to simply identify potential failure modes; the FMEA must provide for follow-up and corrective action.

Manufacturers may be reluctant to produce FMEAs for numerous reasons. FMEAs are time consuming and slow the design or manufacturing process, and they may require additional investment from the manufacturer for engineering analysis. They may be critical evidence in litigation if the FMEA is inadequately performed or the manufacturer does not adhere to it.

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Identifying all potential defendants in the case may require substantial effort. Some modified vehicles—particularly motor homes—are manufactured as "multistage vehicles" rather than "original equipment manufacturer" vehicles like passenger cars. Multistage vehicles are manufactured in at least two separate stages by at least two separate manufacturers.

The incomplete vehicle manufacturer may design and assemble the chassis or frame as well as the engine, fuel system, transmission, drive train, suspension, wheels, brakes, and electrical system. The RV's chassis may be produced by specialized manufacturers or may come from large auto manufacturers such as Ford Motor Company or General Motors.

RVs then proceed to a separate completed vehicle manufacturer. The final-stage manufacturer transforms the chassis into a motor home, installing the "household" items including the coach body, appliances, cabinets, furnishings, plumbing, and other amenities.

Problems arise when one or both manufacturers fail to test the vehicle adequately. The incomplete vehicle manufacturer certifies the chassis itself but often has little control regarding the finished product. Final-stage manufacturers rely on the chassis builder for performance criteria, but they may do so based only on the chassis, without the completed coach body and other components. The completed vehicle may go untested by either manufacturer for its finished center of gravity, weight, or clearance.

Potential defendants for product design defects include any manufacturer or seller in the stream of commerce. These may be not only the incomplete, intermediate, and end-stage manufacturers but also component part manufacturers such as the makers of seats, seat belts, air bags, fuel system components, appliances,[21] propane tanks, propane gas, smoke detectors, and carbon monoxide detectors.

As in any case, discovery is critical. In addition to discovering each manufacturer's design and manufacturing standards for the vehicle, plaintiff lawyers

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should inspect and tour the end-stage manufacturing facility. First-stage chassis manufacturers (which often are major auto manufacturers) will likely have blueprints, designs, engineers, and other sources of information about the initial-stage chassis that can be obtained in discovery. End-stage manufacturers are often less formal and have fewer resources, and they may not have documented information that can be produced in discovery. Attorneys may need to tour and inspect the end-stage facility to discover how the vehicle was actually assembled.

Even if documented information is available in discovery, inspection of the end-stage manufacturing facility remains crucial. It allows you to identify and observe manufacturing techniques, safety inspection, and employee supervision, and it may allow you to identify additional employees involved in the manufacture of the RV.

Expert analyses are essential in these cases. In addition to design engineers, attorneys should consult with process engineering experts. They can establish crucial FMEA violations in the design and manufacturing process.

As sales of RVs and other modified vehicles grow, so will injuries and deaths related to defects. Identifying multiple manufacturers, industry standards, and potential defects may seem daunting, but this information is essential in preparing your case to ensure justice for those who are injured.

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Notes

1. Pa. RV & Camping Assn., National Statistics: RV Ownership, www.prvca.org/National Statistics/tabid/194/language/en-US/Default.aspx.
2. RV Guide, *Buy an RV and Hit The Roads for a Journey of a Thousand Miles* (Oct. 26, 2010), http://guide2rv.blogspot.com/2010/10/buy-rv-and-hit-roads-for-journey-of.html.
3. www.rvia.org; www.rptia.org.
4. Natl. Fire Protec. Assn., NFPA 1192, Standard on Recreational Vehicles, www.nfpa.org/AboutTheCodes/AboutTheCodes.asp?DocNum=1192. NFPA Standard 1192 was formally titled ANSI A119.2, drafted by the American National Standards Institute.
5. *Id.*
6. Recreation Vehicle Indus. Assn., Standards, www.rvia.org/?ESID=Standards.
7. *See e.g. Miles v. Gen. Tire & Rubber Co.*, 460 N.E.2d 1377 (Ohio App. 10th Dist. 1983) (directed verdict for defendant overturned where plaintiff alleged tires supplied with RV were inadequate for its load, vehicle caught fire after collision, and the only escape door was placed directly over fuel tanks).
8. *Boeckman v. Ford Motor Co.*, No. CJ-2007-161 (Okla., Okla. Co. Cir. May 19, 2009).
9. *See e.g. Maskrey v. VolkswagenwereAktiengesellschaft*, 370 N.W.2d 815 (Wis. App. Dist. 1 1985) (court permitted crashworthiness claim for RV bumper override claim); *Gen. Motors Corp. v. Reagle*, 714 P.2d 176 (Nev. 1986) (verdict in favor of mechanic killed when motor home experienced sudden unintended acceleration when entering service bay); *Wyatt v. Winnebago Indus., Inc.*, 566 S.W.2d 276 (Tenn. App. 1977) (products liability claim permitted for defective gear selector that permitted an RV to accelerate forward even though it was in park).
10. *Hayes v. Wheeled Coach Indus.*, No. 042-09581 (Mo., City of St. Louis Cir. Feb 4, 2008).
11. *See e.g. Etchen v. Holiday Rambler Corp.*, 574 N.W.2d 355 (Iowa App. 1997) (RV manufacturer breached express warranty where rear axle bearing caused fire that destroyed motor home); *Alston v. Fleetwood Motor Homes of Ind., Inc.*, 480 F.3d 695 (5th Cir. 2007) (claim permitted under Louisiana law for damages from water leakage through RV's roof).
12. *Curlis v. R-Vision, Inc.*, No. 2006-CA4930 (Fla., Polk Co. Cir. Sept. 12, 2008).
13. U.S. Natl. Lib. of Med. & Natl. Inst. of Health, *Carbon Monoxide Poisoning*, www.nlm.nih.gov/medlineplus/ency/article/002804.htm.
14. *See e.g. Gardner v. Gen. Motors Corp.*, 507 F.2d 525 (10th Cir. 1974) (wrongful death action was sufficient to support product defect claim against pickup manufacturer where pickup was advertised as suitable for carrying a camper unit, and deaths were caused by carbon monoxide from truck's exhaust port that discharged exhaust fumes directly beneath camper).
15. *Ludwick v. United Expresslines, Inc.*, No. CV-3-97-170CC (Mo., Randolph Co. Cir. Sept. 17, 1998).
16. *See e.g. Rocky Mountain Fire & Cas. Co. v. Biddulph Oldsmobile*, 640 P.2d 851 (Ariz. 1982) (court permitted claim against RV manufacturers and dealer where electrical wiring caused RV to burst into flames); *Bankers & Shippers Ins. Co. of N.Y. v. Holiday Rambler Corp.*, 420 So. 2d 1350 (La. App. 3d Cir. 1982) (evidence supported finding that trailer manufacturer installed defective copper flare connection leading into central-heating unit of travel trailer, causing fire that destroyed trailer).
17. *Thurston v. 3K Kamper Ko, Inc.*, 482 A.2d 837 (Me. 1984).
18. *Rhodes v. Amega Mobile Home Sales, Inc.*, 186 S.W.3d 793 (Mo. App. W. Dist. 2006).
19. *Jones v. Winnebago Indus., Inc.*, 460 F. Supp. 2d 953 (N.D. Iowa 2006) (Iowa law permitted parents to submit punitive damages claim for death of child during retraction of slide-out room on RV).
20. SAE Intl., *Potential Failure Mode and Effects Analysis in Design (Design FMEA), Potential Failure Mode and Effects Analysis in Manufacturing and Assembly Processes (Process FMEA)*, http://standards.sae.org/j1739_200901.
21. *See e.g. Ratner v. Norcold, Inc.*, 2011 WL 1789967 (M.D. Tenn. 2011) (court permitted claim against component supplier of RV's refrigerator for fire that destroyed the vehicle).

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