

**Survival
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USA**



Submerged Vehicle Egress

By Ben Rayner

It is a rare event, but one that drivers, especially those with children should be prepared for—a full vehicle submersion in water. Safe drivers have an emergency winter kit for their vehicle and a submersion safety kit should be part of a driver's overall safety preparation as well. According to on-line statistics, there are discrepancies in the number of people who drown in submerged vehicles every year. Several sources cite 300 per year in the US, other double that figure to 600 per year, still others cite a 300-500 per year number (In 1999 in the US 350 deaths were reported.) These statistics are further blurred by the fact of what constitutes and what is reported as a submersion death. Many law enforcement organizations have differing criteria and what is reported as a vehicular drowning in one jurisdiction may be classified as an automobile accident death in another. Whatever the number, there are simple steps that can prevent this tragedy.

Dispelling myths about vehicle submersions is the first step in a safety plan. Many drivers, mostly rural males, report that they do not wear seatbelts for fear of entrapment in fire or water. (See references). This view is shown by statistics to be unfounded. Automobile accident entrapment scenarios are quite rare and your chances of being unconscious and unable to react to an emergency rise dramatically if no seatbelt is worn. (See reference below)

There are numerous blogs and sites on-line that give advice on how to escape a sinking car. Many are written by individuals who have been involved in close calls and want to relate their experiences. Much of it is relevant and of value, but keep in mind that every accident is unique. Several of these sites testify to the ease and relatively non-violent impacts that occurred during their particular accident. However, this is not a hard and fast rule, it is just as likely that your vehicle will enter the water upside down or at an angle, making egress all the more difficult and vital. (Try finding your window punch or your window lowering button while you're upside down, underwater with a broken arm). Also, many sites quote statistics that opine that a vehicle will take two to ten minutes to sink. While this may be true of a vehicle that enters the water at a moderate speed and

right side up, these factors have little to do with an impact of 60 miles an hour in which a vehicle enters the water upside down. The time it takes for your vehicle to sink is dependent on several factors, including style of your car, whether windows are open, whether underbody panels are installed on your vehicle and whether they are still in place. Even the water temperature can be a factor in submersion. Though in some scenarios cars can actually float indefinitely, in others they can submerge in a matter of seconds. Don't rely on any predetermined length of time for your extrication or egress from a submerging vehicle.

Keep in mind that electric windows may not operate when immersed in water. Some child safety mechanisms may also interfere or not allow the window to operate during immersion as well. Recommended egress equipment includes a window punch or window hammer. These devices will break a window in an emergency, but only if you know how to use one. Make sure it is securely fastened in a part of the car that is reachable to you while in your seat belt. Seatbelt cutters or knives are also a valuable rescue device, but also have the same restrictions as window punches. Make sure you know how to use them and that they are within a reachable distance. The key factor in having any type of window punch is to know where it is. In an accident, especially in a rollover scenario, items within a vehicle are at the mercy of physical forces. A window hammer placed in a driver's side door slot will probably not be there after a violent accident. Making sure that an escape tool is securely fastened and within reach is the best way to ensure your ability to get out.

There are conflicting opinions on whether it is possible to open a car door underwater or half submerged. However, there shouldn't be. Experiments, including those from the *Discovery Channel* TV show, *Myth Busters*, prove quite convincingly that this effect will occur. (See references and statistics below.) There are a number of variables, including the vehicle style and depth of the water, but what is not in question is that at some point, no matter your strength, a vehicle door will simply not be able to counteract the hydrodynamic forces acting upon it. An occupant can wait until the vehicle is completely submerged and this will equalize those forces acting on the door, but the critical threshold of this scenario varies and even when the forces lessen it still may be extremely difficult to open a door, especially if you are injured or dazed from the impact.

Child safety seats are also a factor that needs to be addressed and prepared for. Pulling passengers from submerged vehicles, especially children, is also a scenario that has many variables. The chances of a parent being able to extricate themselves and a child strapped into a car seat are highly unlikely in a fully submerged vehicle. Just as in an aircraft ditching scenario where a parent puts on their oxygen mask before a child, it is important to extricate yourself first and then concentrate on other passengers.

Though statistically rare, it cannot hurt to be prepared for an accident of this kind. Create an immersion egress plan, keep any emergency/extraction tools secured and handy, and know your vehicle.

SSUSA is currently developing a submerged vehicle egress course based on their SVET (Submerged Vehicle Egress Trainer) course developed for the US Marine Corps. This course has saved the lives of countless Marines during their deployment and it can help save your life or those of your family.

References:

- 1) A 1983 University of Michigan study (<http://deepblue.lib.umich.edu/bitstream/2027.42/251/2/48561.0001.001.pdf>) found that the fear that seat belts might trap an occupant in a vehicle that caught fire or plunged underwater was the most frequently stated concern of Michigan drivers. According to this study, only one of every 190 people who used a seat belt was unconscious, compared to one of every 78 occupants who did not wear one.
- 2) A study of 1981 crash statistics by the university's Transportation Research Institute (<http://deepblue.lib.umich.edu/bitstream/2027.42/67129/2/10.1177.109019818401100205.pdf>) concluded that deaths from fires accounted for less than 3.6% of passenger car occupant deaths; drownings for 1.4% of occupant deaths.
- 3) A 1996 National Highway Traffic Safety Administration (NHTSA) report identified that young men in rural areas who drove pickup trucks said they were reluctant to use seat belts, in part, because they believed “that being unbelted in a crash is actually safer than being belted.” NHTSA stated in the report that this belief was unfounded.

The following are the testing results from Myth Busters episode # 72, where they attempted to confirm or bust submerged vehicle myths...note that a second vehicle submersion episode was filmed in 2010 and the results were in some cases slightly different. See below episode #155 Inverted Car Underwater.

Episode 72: Underwater Car

Air Date: January 24, 2007

If a car falls into the water and becomes submerged, you cannot open the door until the interior is flooded.

confirmed

The pressure differential between outside and inside when the car is submerged is too great for a man to force the door, and the pressure must first be equalized, which means the interior must be flooded first. But it should be noted that Adam was forced to resort to emergency air in his first test. A second test later showed it to be possible to escape the car simply by opening the door, but only by remaining calm and not attempting to open the door until the interior is well and truly flooded, so as to conserve oxygen while holding your breath.

You can escape a car that has fallen into the water immediately after hitting the water.

confirmed

There is not enough water pressing on the door to keep it shut. Adam escapes easily.

You can escape a car that has fallen into the water as soon as the water inside the car is up to your waist.

confirmed

Adam barely manages to force the door open and is even briefly submerged before he emerges from the car.

You can escape a car that has fallen into the water as soon as water covers the car window from the outside.

busted

At this point, the pressure differential has become too great. Adam is unable to escape.

You can open a window in a submerged car by using a manual window crank.

busted

Using a test weight of 350 lbs (equivalent to pressure differential from just two feet of immersion), the pressure of the window glass against the frame is so great that no amount of effort can move the gear. You are more likely to break the window handle.

You can open a window in a submerged car by opening power windows.

busted

Though more powerful, power windows still cannot overcome the pressure differential. Contrary to popular belief, though, power windows can withstand immersion in fresh water for prolonged periods and still function.

You can open a window in a submerged car by attempting to break the window using a set of keys.

busted

Window glass is tempered and resistant to impact from blunt objects. Keys are ineffective.

You can open a window in a submerged car by attempting to break the window using a cell phone.

busted

A cell phone is ineffective.

You can open a window in a submerged car by attempting to break the window using steel-toed boots.

busted

Boots are ineffective.

You can open a window in a submerged car by attempting to break the window using a window-breaking hammer.

confirmed

The device is designed with a pointed tip designed to shatter tempered glass. The hammer breaks the window on the first try.

You can open a window in a submerged car by attempting to break the window using a spring-loaded center punch.

confirmed

The point of the punch can work like the tip of the hammer, and punches are sold for the purpose of breaking window glass. The punch breaks the window on the first try.

From Episode #155: Inverted Car Underwater

It is more difficult to escape from a sinking car that flips upside down than from one that remains right-side up.

confirmed

Jamie first built a device to spin a person underwater in an attempt to induce disorientation. Though Adam was consistently able to swim to the surface, Jamie had some trouble doing so himself.

Next Adam and Jamie arranged a full-scale test at a man-made lake, placing a car on a barge and making it flip upside-down when pulled into the water. Adam sat in the driver's seat with emergency air tanks and a safety diver also inside the car. His goal was to escape without breaking a window and without using the air supply. As soon as the car hit the water the windshield cracked and began to leak water. Adam could not open the door until the car completely filled with water, equalizing the pressure on both sides of the door. The car did two half-flips while sinking and Adam became somewhat disoriented. He eventually surfaced, but admitted that he had to use the air supply, so he and Jamie declared the myth confirmed