

Outboard Motor Strikes Submerged Object and Flips Into Boat: Accident and Injury Mitigation									
PropellerSafety.com		Version: 26 November 2014						print size = 40 inches X 48 inches	
This is NOT professional advice. This table was constructed to generate discussion and to raise awareness.					Time Period				
	Regular Ongoing Programs and Operations	Earlier on Day of Accident	Boat Enters Area of a Marked or Visible Hazard	During Strike	Drive Enters Boat	Immediately Post Accident	Days Following Accident	Long Term Post Accident	
PropellerSafety.com	1. Increase awareness of this type of accident 2. Increase awareness of relevant technologies 3. Increase awareness of existing solutions							1. Archive media coverage of accident 2. Add accident to our list of similar accidents 3. Post coverage of the accident	1. Request copy of accident report 2. Assist legal teams with information needs
Boat Operator & Passengers	1. Obtain insurance for boat and those onboard 2. Take a boating safety class 3. Report large floating debris to authorities 4. Consider carry a backup drive onboard (kicker motor / trolling motor) when possible 5. Trained in first aid, and especially in use of tourniquets, and in use of towels to apply pressure to wounds to reduce bleeding 6. Keep a well stocked first aid kit onboard 7. Check tightness of outboard mounting bolts	1. Wear a properly fitted life jacket 2. Use polarized sunglasses to better observe submerged objects when appropriate 3. Have one or more communication devices for emergencies (cell phone in areas where cell phones work, marine radio) 4. Check jack plate / lift plate for tightness	1. Reduce speed 2. Follow site warnings 3. Maintain proper lookout 4. In extreme cases, wear a helmet			1. Quickly request emergency assistance using care to provide correct location 2. Apply first aid, use tourniquets and towel pressure on wounds as necessary 3. Use auxiliary drives (kicker motor or trolling motor) or an oar to reach shore if necessary	1. Alert insurance company 2. Make sure accident report is filed 3. Visit with a lawyer to help with insurance claims and potential legal action against other parties 4. Store boat and drive in a secure location if legal action is anticipated	1. Begin repairing boat and outboard motor if legal action is not anticipated 2. Long term legal effort if elect to pursue 3. File insurance claims 4. Rehab injuries 5. Families must adjust to their loss in fatal or physical/mental capacity limiting accidents	
Accident Bystanders	1. Trained in first aid 2. Trained in use of tourniquets and in the use of towels to apply pressure to wounds to reduce bleeding					1. Request emergency assistance using care to provide correct location 2. Respond and help 3. Provide witness statements to authorities			
Off Duty Medical Professionals	1. Programs encouraging them to be on and near the water					1. Respond to assist accidents they witness			
Outboard Motor Manufacturers	1. Log strike test their drives 2. Place warning in manual and on outboard of possibility of flipping in when striking floating/submerged objects and how to minimize the risk 3. Consider using crushable leading edges and nose cones 4. Consider using triangulate components to allow drive or part or drive to break away during a very severe log strike 5. Consider using a cable strap over the outboard anchored to the transom to prevent the outboard from entering the boat 6. Develop strong, light weight, composite gear cases (less weight rotating) 7. Maintain product liability insurance 8. In conjunction with boat builders, design a boat "brake" (some victims report seeing the hazard without time to stop) 9. In conjunction with others, develop floating and submerged object detection systems 10. Optimize performance of log strike system 11. Regularly monitor accident reports involving their outboards and those of their competitors			1. Log strike system prevents outboard or parts of outboard from entering the boat in as many strikes as possible 2. Reduce engine speed as it starts upwards (Sanshin U.S. Patent 4,734,065) 3. Cham or cable on jack plate / lift plate prevents entire plate and drive from entering boat 4. Rope or cable across or tether to outboard anchored to transom prevents it from entering the boat	1. Shut off power to drive (Krueger U.S. Patent 2,917,019) 2. Propeller guard prevents propeller from striking people onboard		1. Legal department monitors news media and field reports from their own people for serious and fatal accidents involving their products and those of other outboard manufacturers (similar accidents are often mentioned in the wake of another one)	1. Properly arrange for download of data logger "black box" data from outboard and chain of custody of same 2. Respond to legal filings 3. Provide repair parts for damaged outboard motor and a trained local service staff 4. Continue improving their log strike systems 5. Review their warnings for effectiveness 6. Improve their products based on what they learned from this accident and others like it	
Aftermarket Manufacturers	1. Make sure jack plates / lift plates can securely and safely handle log strikes 2. Market propellers of less risk to people in the air (RingProp, Australian Environmental Safety Propeller, safety propellers) 3. Strap or cable to tie drive to transom 4. Avoidance systems (Remner U.S. Patent 5,238,432)								1. Serious and fatal accidents sometimes provide inspiration to individuals and aftermarket companies to develop solutions
Boat Builders	1. In conjunction with outboard manufacturers, design a boat "brake" 2. Obtain product liability insurance 3. Place warnings in manual and on boat of hazard of striking objects and outboard flipping in, and how to minimize the risk 4. Consider alternative propulsion methods on some applications (tunnel drives, inboard drives, pod drives, L-drives, surface drives, jet drives) 5. Consider placing outboards in wells (hidden outboards) 6. Design boats to require minimum length drive "legs" (reduce radius of rotation) 7. Mechanical barriers to prevent the outboard from entering the boat			1. Mechanical barriers prevent outboard from entering the boat					1. Respond to legal filings
Insurance Companies	1. Provide and market insurance to the players involved (boaters, product liability insurance to drive manufacturers, product liability insurance to boat builders 2. Provide economic incentives to manufacturers for making safety improvements								1. Investigate and pay insurance claims
Entity	Law Enforcement	1. Train in investigating boat accidents 2. Maintain a presence on the water 3. Develop a relationship with facilities on the water (marina's, rental operations) 4. Invest in communication systems that are effective to, from, and at large nearby water recreational areas				1. Respond to accident 2. Assist with rescue efforts 3. Secure and store the vessel in fatal accidents 4. Begin writing accident report 5. Take statements from witnesses	1. Retrieve outboard motor if sank 2. Complete accident report 3. Include photographs of the outboard and boat with the accident report, with special attention to areas that failed/broke		
	Standards / Regulations ABYC/USCG	1. Establish a log strike test standard 2. Review dredge pipe marking regulations in light of our list of dredge pipe strikes 3. Consider creating a separate marking requirement for inland boating lakes when pipes are allowed to float that includes a reasonable minimum distance between buoys							1. Review and update standards on a regular schedule and as new technologies become available 2. Be prepared to act relatively quickly when necessary, if even only to issue a bulletin stating concern about a certain issue
Legislators	1. Pass broad Good Samaritan laws (bystanders can help without risk of being sued, including off duty medical personnel that happened to be nearby)								1. Consider regulations proposed by victims and surviving family members
U.S Coast Guard	1. Raise awareness of this type of accident 2. Create a Public Service Announcement (PSA) on striking floating and submerged objects in general, and point out the hazard of outboards flipping into the boat 3. Make sure temporary and permanent floating and submerged hazards are properly marked. Issue bulletins when necessary					1. Make sure the hazard is properly marked after the accident	1. Make sure the state files an accident report 2. Investigate accidents under their jurisdiction	1. Include the accident in the annual BARD database and in the annual boating statistics report 2. File accident reports for accidents under their jurisdiction	
Dredging Operations	1. Mark the hazards (floating/submerged pipe, dredges, barges, etc) in compliance with U.S. Coast Guard regulations 2. Lighted warnings / buoys 3. Inform local boating / fishing groups of the hazard 4. Obtain insurance covering claims by those who may strike the pipe or related hazards 5. Maintain a single list of those who struck the pipe and details of those strikes, make sure other parties know how to refer those who strike the pipe to the keeper of the list 6. Do not "float the pipe" at busy times (weekends, major holidays, special events, etc.) 7. Regularly inspect the line of buoys for the buoys not breaking free and drifting away		1. Put crews on the water to warn boaters when necessary			1. Add additional warnings if necessary	1. Review accident for ways to prevent future similar accidents	1. Implement safety measures identified during accident review	
Fishing Tournaments	1. Make contestants aware of the risk of outboard motors flipping into the boat 2. Make contestants aware of any special hazards on the water, including temporary hazards 3. Obtain insurance against claims filed by participants 4. Sponsor some tournaments requiring smaller horsepower outboards (reduce speeds) OR with a speed logger on the boat that trips if you go beyond a certain speed.					1. Alert crews to the accident and hazard	1. Review accident for ways they could help prevent future similar accidents	1. Implement measures identified during accident review	
Stewards of Lakes USACE, Organizations, Cities, States	1. Warn of unique hazards on the water, including temporary hazards 2. Have a debris removal program to keep large debris off the lake 3. Remove submerged stumps in shallow main thrufares 4. Mark stump fields on local maps and by signage as needed 5. Obtain insurance against claims filed by those using the lake						1. Review accident for ways they could help prevent future similar accidents	1. Implement measures identified during accident review	
Marinas	1. Make clients and visitors aware of hazards on the water, including temporary hazards 2. Make sure any local dredge pipe strikes are reported to the keeper of the list					1. Serve as a staging area for rescue crews, paramedics, law enforcement, and as a landing site for Life Flight services 2. Assign someone to direct traffic to the appropriate location 3. Keep onlookers at a distance	1. Review accident for ways they could help prevent future similar accidents	1. Implement measures identified during accident review	
Hospitals	1. Establish trauma units near major boating areas 2. Have room in intensive care for patients that may be there many days 3. Make sure surgeons are familiar with propeller accidents and how to treat them					1. Care for patient when they arrive 2. Maintain sufficient blood supplies (some propeller injury patients have required 50 to 80 units) 3. Use body cooling techniques (hypothermia therapy) when appropriate 4. May declare patient dead on arrival	1. Continuously monitor wounds for infections from waterborne bacteria	1. Assist patient with prosthesis needs, rehab, financial counseling, and with their insurance	
Emergency Dispatch	1. Frequently attend training opportunities 2. Become knowledgeable of boating areas in your region 3. Keep maps of boating areas on file or on the wall					1. Be on duty 2. Dispatch appropriate help to the correct location. Note the correct location and how to get there has proven critical in many propeller accidents 3. Keep someone on the line till help arrives			
First Responders, Local Paramedics	1. Frequently engage in on water and near water training exercises 2. Know their way around local boating areas					1. Quickly respond to the correct location 2. Respond to the scene with equipment, supplies, and transportation to rescue the patient			
Life Flight Providers	1. Frequently engage in training exercises 2. Be aware of landing sites near major boating areas					1. Be on duty 2. Respond to correct location 3. Stabilize and transport patient to a trauma unit	1. These accidents are sometimes brutal enough that trained professionals may need counseling as well	1. Sometimes reunions are held months to a year later so survivors can meet those who rescued them	
Rehab Providers	1. Be available for boaters and others in the region							1. Provide long term rehabilitation services	
Navigational Chart Providers	1. Mark water hazards on paper and electronic editions								1. Update navigational charts with information on previously unknown submerged hazards
Community	1. Establish life flight landing sites near major boating areas 2. Be regular blood donors 3. Community efforts to remove debris from the lake						1. Community support for victims and their families 2. Hold fundraisers to help pay medical costs and living costs for survivors and their families 3. Conduct blood drives to provide and replace blood used by the victim	1. Welcome patient home from the hospital 2. Build handicap ramp to their home if needed	
Lawyers	1. Some lawyers specifically cater to victims of boating accidents 2. Corporate lawyers develop legal strategies for use in propeller accidents 3. Corporate lawyers attend BIRMC (Boat Industry Risk Management Council of the National Marine Manufacturer's Association / NMMMA) 4. Corporate lawyers review operators manuals, warnings, and warning decals/placards						1. Lawyers are contacted by boating accident victims or their survivors for assistance in dealing with insurance companies and to discuss possible legal actions against parties they see as responsible for the accident 2. Corporate legal departments monitor news reports and from reports from their people in the field to identify very severe and fatal accidents involving their products	1. Lawyers represent victims of propeller accidents in legal cases 2. Lawyers represent boat operators, marine drive companies, boat builders, and others accused of contributing to the accident 3. Arrange for downloading data from outboard motor "black box" / data logger and from other electronic devices onboard (gps, mapping software, fish locators, depth finders, etc.)	
Others						1. Church leaders and counselors provide comfort and counseling to families of those who did not survive 2. County coroner may declare injured individual dead at the scene 3. Local news media covers the accident and educates public of the frequency and severity of these accidents	1. Local news media does followup stories on recovery of victim or surviving family members coping with challenges	1. Psychological counseling for patient	