August 29, 2003

Memorandum

To: Mary Parkinson

From: Ed Wickersham

Subject: Accident Analysis, Vessel Towing Scientific Equipment

Summary:

During the last several years within the Department of Interior (DOI) and it's Bureaus there have been a number of boating accidents associated with vessels that were towing scientific sampling equipment that became entangled on the bottom. The vessel crews are unable to free the vessel and subsequently the vessel swamped or capsized as a result of current or seas. This type of accidents has resulted in the significant repair costs, in some cases the loss of Department of Interior vessels and at least one death. This Accident Analysis reviews the circumstances surrounding 6 accidents of this type.

It is the intent of this safety analysis to attempt to identify the factors that are contributing to these accidents and what measures should be taken to prevent similar accidents from occurring in the future. The information in this report has been assembled from interviews with individuals involved in the accidents and review of official reports generated as a result of those accidents.

As stated above, boating accidents that occurred while DOI vessels were involved in scientific data collection have resulted not only in substantial material loss but the death of an employee. As noted in reports that were reviewed only luck prevented that number from being higher. There is important information that can be learned from the analysis of the facts surrounding these accidents. However, anytime there is loss of life particularly when it is associated with a reoccurring accident scenario such as this, it is incumbent upon the safety community to assess those contributing factors in the hope of developing directives that will reduce if not eliminate the risk of that type accident occurring in the future.

The Accidents:

On June 22, 1994 a USGS (United States Geological Survey) owned 24' I/O powered, welded aluminum hull custom manufactured Munson boat was conducting sturgeon egg and larvae trawl netting approximately ½ mile downstream of Priest Rapids Dam on the Columbia River. The trawl gear became tangled on the bottom and the vessel lost steerage and was swept down stream capsized and sank. The two scientists escaped with one broken clavicle and bruises. The boat was salvaged and the repairs and related costs were approximately $50,000.00

The vessel being operated by two, National Biological Survey, scientists was conducting stationary trawling in the tail-race of Priest Rapids Dam. The current at the time of the accident was measured at 10 to 10.5 FPS (feet per second). The trawl was attached to the boat with two steel cables rated at over 2000 pounds breaking strength. These ran through a mast and fair lead arrangement attached to the stern of the boat with the final attachment point elevated 2 or 3 feet above the transom of the vessel before the warps entered the water. Each warp was operated by a hydraulic pump that was turned on and off by the operator. The vessel was equipped with a cable cutter immediately available to the crew member that was operating the trawl.

It is not confirmed whether the net became tangled causing the boat to loose steerage or if the boat was forced abeam by the strong current and as it was swinging the gear and or lines became tangled. Regardless, approximately 2 to 4 seconds elapsed from the time the boat started to swing down current to the point at which it began to roll. When the vessel began to roll the crew estimates that the vessel was completely capsized in no more than 1 or 2 seconds. The crew reported there was no time to cut the cable or turn on the pumps to release line before the boat was capsized. “There was no time to react.”

The crew reported that they had their PFDs (Personal Floatation Device) immediately beside them but not on. When the boat capsized it was very difficult to extricate themselves from the cabin. One crew member retained his PFD and donned it upon freeing himself from the cabin. Seconds later the second crew member appeared without a PFD. They pulled themselves up on the overturned craft. In a few minutes it became apparent that the floatation in the hull was inadequate and the boat continued to sink. The crew stated that the vessel relied upon compartmentalization for floatation. “The compartment bulkheads had minor compromises (wiring, cables and a small drain plug) Plugs were not kept in place because water would build up over time (even though we had self bailing decks and a sealed freeman hatch) This allowed the compartments to fill slowly with water. A larger problem was that the engine room, which accounted for about 30 to 40 percent of the compartment space, had a sealed hatch cover that was about 3’ x   4’ which opened when the boat capsized. It would only stay closed if a padlock was kept in place. The hatch was not kept locked because the fuel tank selector switch was in the compartment (obviously a very poor design). The stern sunk much faster than the rest of the boat because the compartment filled with water in seconds.” They finally decided they would have to swim for shore. They did this sharing the life preserver. The water temperature was approximately 55 degrees F. They estimated it took about 30 minutes to get to shore. When they got to shore they were both exhausted and one of the scientists was unable to stand for approximately 10 minutes.

The salvage of the vessel could only be accomplished after the Bonneville Power Administration substantially reduced the flow of the Columbia River by manipulating the discharge at four upstream dams.

On June 18, 1998, A New Jersey Marine Sciences Consortium, owned 28' Twin O/B powered, Aluminum R/V, chartered by West Virginia University Cooperative Research Unit, swamped and capsized while conducting night trawling operations for Bay Anchovy research on the Lower Hudson River in the vicinity of the George Washington bridge in New York City. The accident resulted in the three member crew abandoning the vessel which ultimately led to one fatality. The vessel was a total loss at an estimated value of $100,000.00.

At the time of the accident the vessel was trawling against a tidal current, exact speed unknown however current velocities in excess of 5 fps in this area are not uncommon. There were no appreciable seas. The trawl was deployed from the stern. The crew attempts to keep the trawl in mid-water not on the bottom. The local charts indicate under water obstructions on the bottom in the area where the accident occurred. The trawl became entangled on the bottom or bottom debris and the vessel swamped and capsized in seconds. The vessel was typically equipped with a line cutter that was to be immediately available for the crew to cut the trawl line if necessary. When the accident occurred the line cutter was not available and the crew were unable to “free spool” the trawl winch within time to save the vessel. The crew were not wearing PFDs. Before trawling operations begin it was policy on this vessel that the master was to brief the crew on emergency procedures. The briefing was not conducted in this instance. The vessel involved in this accident was designed to conduct marine research, and all of the masts and equipment handling structures were designed and installed by the manufacturer.

July 8, 1998, 2:10 P.M. during daylight hours, a USGS (United States Geological Service) owned 17' Monarch, sinks on the Mississippi River near Rolla, MO as a result of the sounding equipment they were towing becoming entangled on the bottom or with debris. The boat is a total loss with a replacement value of approximately $15,000.00. The three member crew all survived.

At the time of the accident the vessel was operating in approximately 50 feet of water. The water velocity was about 5 fps. The sounding equipment was deployed from the starboard stern quarter of the vessel. When the line became entangled the vessel was unable to maneuver effectively and swung downstream in the current. The crew was unable to cut the cable to free the boat. The scope ratio of the line to total depth was likely very low. With the boat essentially anchored stern to the current, unable to maneuver and the crew unable to cut it free, sinking was inevitable and occurred in a matter of a few seconds. The crew were all wearing PFDs which substantially contributed to their survival.

On November 6, 1998, a 22' USFWS owned outboard powered glass boat, swamped and capsized while conducting biological research with a gillnet in Chesapeake Bay near Annapolis, Maryland. The four scientists, who were all wearing PFDs or work suits survived and were rescued.. The cost of repairs to the vessel was in excess of $10,000.00.

The vessel was conducting data collection using a gillnet when the net became fowled on the propeller. The winds had been building and were gusting between 20 and 25 knots. When the net fouled in the propeller the vessel swung stern to the wind and sea due to the net acting as a drogue. The seas were breaking over the stern into the vessel. The crew attempted to free the net from the engine however they were unable to cut it free because none of the crew had a knife. Their only method of removing the net from the engine was over the transom which reduced freeboard aggravating their situation. The vessel swamped and capsized. The water temperature was approximately 53 degree F. Fortunately another vessel was in the vicinity and effected a rescue within a few minutes of the accident.

On November 4, 2000, the R/V BALLENA, a 56' NOAA (National Oceanic and Atmospheric Administration) owned research vessel with a master and two USGS scientists capsized and sank from the effects of being struck by a “rogue” wave while towing geophysical equipment. The BALLENA was operating off of the California coast during daylight hours. All three crew members survived. The vessel was a total loss at a value in excess of $100,000.

At the time of the accident the vessel was towing the geophysical equipment from an elevated attachment point of a stern mounted A frame. This towing configuration had the effect of reducing the vessels steering response. This vessel had also recently been modified which resulted in a net reduction in displacement of approximately 5 %. It is likely that when the vessel was struck by the large wave the vessels reduced maneuverability and stability significantly contributed to the capsizing. What is most instructional about this accident is the speed in which the vessel capsized even though it was a relatively large vessel. With this accident we again see a vessel being effected by stern sea conditions and capsizing in seconds. This vessel is much larger than those commonly used by most of our employees who are involved in these types of activities, yet it capsized in seconds.

On July 7, 2002, a 23' Clark, welded aluminum inboard jet powered motorboat belonging to the USFWS was trawling downstream conducting pallid sturgeon research with an otter trawl, on the

Missouri River between St Louis and Kansas City during daylight hours. The towed gear became tangled on the bottom or with bottom debris. The vessel swamped from the stern and capsized. The four scientists on board were all wearing PFDs and survived without injury. The boat was salvaged and repaired at an approximate cost of $20,000.00.

At the time of the accident the vessel was operating in water depths of 7' to 20' with the trawl out approximately 100' feet behind the vessel. The water velocity was approximately 5 fps and at a temperature of approximately 80 degree F. The crew reported that they trawled downstream because they had worked on another boat on the Mississippi River that did trawl upstream and were not satisfied with the results. It was their conclusion that the, “jet blast” would scare away any fish before they could be trapped in the trawl, therefore making their collection efforts inefficient. The boat operator reported, ”it was common for the trawl to get hung up.” When that occurred they would back down, free the gear and then go on with their data collection.

The boat was purchased from the Clark company who is on GSA contract. The boat and equipment were designed by the manufacturer, based upon specifications from a Nebraska vessel used for the same type of work. The trawl they used was a small conventional otter trawl. It was attached to the boat through a mast arrangement attached to the rear portion of the boat that directed the trawl warps into the water on both stern quarters from about five to six feet above the gunwales and approximately two feet to the side. The trawl was attached to steel cable.

The standard operating procedure was for one scientist to operate the boat, one would operate the trawl and the other two crew would assist where needed. In case of a hang up, it was the responsibility of the trawl operator to release the clutch on the winch so the cable would slip taking tension off of the trawl while the operator would back down to free the gear. As a back up, immediately available to the trawl operator was a device for cutting the cable. That device was available when the accident occurred.

The crew reported that the trawl hang up was so violent that the crew member operating the trawl was thrown away from the control and was unable to return to the winch controls to release the winch or cut the cable before the vessel swamped from the stern and capsized. The accident occurred relatively close to shore and all four crew members, all wearing PFDs, were out on shore in a few seconds with no injuries.

Some observations the crew made concerning the accident:

- The trawl warps were so strong that they would not break, and the winch had no “drag” feature causing the boat to remain stationary in the current.

- As the boat swamped several of the hatches on the boat opened and filled up with water contributing to the inability of the vessel to stay afloat.

- The height of warps above the gunwales significantly contributed to the vessels instability when it hung up with the vessel quartering the current. The vessel was pulled over sideways with no time for the crew to respond.

When the vessel was salvaged and repaired the following modifications were made. The winch was equipped with a friction brake, “drag”. The cables have been replaced with rope so they can be cut with a knife. The gas tank which was mounted in the bow was moved low on the centerline of the boat. The fairlead for the warps was redesigned so the warps enter the water below the gunwales of the boat close to the water level. All of the hatches were equipped with locks to insure their watertight integrity in the event of an accident. Although it is impossible to know every location where a bottom obstruction might be encountered areas with bottom obstructions and water velocity in excess of 3 FPS are now being avoided when possible.

Contributing Factors:

In reviewing these accidents a definite pattern of factors develop that not only contributes but arguably is the cause of each of these accidents. In some cases the contributing factors can be mitigated but not totally eliminated. Other factors now identified can be eliminated with responsible actions of our supervisors and employees who operate our vessels.

Factor 1: The first contributing factor that must be discussed is the skill level of many if not most of our motorboat operators. We have many boat operators but very few professional mariners. What that means to this issue is that the personnel leading these projects are likely to not have the skill and understanding to fully comprehend the potential danger associated with the boating activity they have set out to accomplish. This fact becomes undeniable as your review these six accidents. Even in those instances where the operator was a licensed master that does not guarantee that the person understands the hazards inherent in towing scientific equipment under water.

Factor 2: In each of these accidents one constant persists: moving water, either current or wave action. The affect of moving water on a boat hull cannot be over stated. Associated with this was towed equipment becoming entangled on the bottom or bottom obstructions causing the vessel to stop or slow down in that moving water. Further aggravating the situation was the point of attachment of the equipment on the hull. In each of these accidents the equipment was attached to the stern or became tangled on the stern of the vessel. When this happens in moving water the vessel swings with it's stern to the seas. If the gear was tangled fast to the bottom, the ratio of line to depth became critical. The shorter the rode the more downward pressure on the vessel hull by the moving water. As you increase the velocity of the water there is a point that is reached where reasonably no length of line is adequate to keep the vessel safe.

If the equipment is attached rear of amidship the vessel will turn with the stern into the current and wind in a hang up or loss of power. Because the stern of a vessel must move laterally to maneuver, when the equipment is attached at the stern, the vessels ability to maneuver is restricted at best. As you increase the velocity of the water or wind at some point the vessel loses all maneuverability. It then is truly at the mercy of the elements and the crew is left with few options to save their vessel. We must remember, if you are towing some type of equipment in a calm body of water, and become tangled with the bottom, you can stop and disengage from the hazard. Where exactly the equipment was attached to the boat is of little concern. As you add wind and current the point of attachment of the gear and the vessels ability to release the tow rapidly becomes a matter of survival

Factor 3: The height of the tow line above the vessel is critical. As you increase the height of the attachment point, relative to the vessel, you increase the instability of the vessel based upon the force that is exerted on that elevated point. This instability is also directly related to the angle of the force on the hull. If the force is exerted symmetrically directly astern there may be little apparent effect on the vessels stability. As you move that angle to the quarters or amidship, the same force that was of no concern when it was applied to the stern becomes critical as it moves to the beam of the vessel. Several of these vessels capsized, literally in “split seconds” when their gear became fast to the bottom. Each one of those vessels was towing their gear from an elevated point. This is simple physics, the longer the lever the less energy it takes to move that lever based on fixed resistance. The vessel ballast is that fixed resistance. As the towed gear became tangled in the bottom and the vessel lost maneuverability and swung downstream in the current the elevated attachment point directly effected the capsizing of the vessels. In moving water an additional condition that aggravates this situation is the friction of the water moving under the hull. As the vessel swings to a downstream position the force at the top of the lever is pulling the down stream portion of the hull up. The force of the water moving under the hull is pushing the upstream portion of the hull down. In this configuration you have created the perfect symmetry to capsize a vessel rapidly using natural forces. As we have seen that is exactly what happens.

Finally, it is the crew’s ability to detach from the equipment. When the vessel is held fast by the towed equipment the most critical action the crew must be able to affect at this point is to detach from their gear. Two facts come through clearly when we review these accidents. The towed equipment is attached to the vessel with such a secure link that even when the vessel is effected by current or waves so severe that the very survival of the vessel is in question, the gear does not detach. Secondly, in most cases the accident scenario evolved so rapidly that there was no time, for a crew member to sever the line before the vessel was lost even when the crew had developed a plan and had the cutting equipment available. In at least two of the accidents the crew had nothing to sever the lines with. In one of those accidents a strong argument can be made that the vessel was lost for lack of a knife. That crew had not planned on dealing with that contingency or the cutting equipment they had planned to use was unavailable. Apparently the risk was never considered. However the conclusion that is reached in reviewing the accidents is that in most instances the crew will not have time to sever the line and there must be something else in place to insure that before the vessel is lost the gear must detach.

While reviewing the accidents and discussing the issues with some of the individuals involved with these accidents the concern with budget constraints pervaded the decisions concerning boating equipment in almost all of the incidents. Personnel involved in several of the accidents recognized that there were better equipment options available but the cost was higher and the project personnel were under budgetary pressure to “get the job done” and “not go over budget.”

Administrators and supervision must guard against creating the appearance that safety shortcuts will be justified by budgetary constraints. There must be official recognition that on water work includes inherent increased risk, particularly when our personnel are involved in specialized activities that require substantially increased boating skills, such as the type of projects that are being reviewed in this report. Without a detailed financial analysis we can readily conclude from a cursory review of the six accidents detailed in this report that compromising safety concerns ultimately cost much more than what it would have cost to reasonably upgrade the vessels to address the safety concerns.

If we consider these six accidents it becomes very apparent that in each case an outlay of ten to fifteen thousand dollars, at the most, would have satisfactorily addressed the vessel safety issues, much less than that in several of the accidents. If we add up the reasonable total cost of these accidents from purely financial perspective we see how short sighted that philosophy is. In fact, in none of the cases reviewed would the desired outlay for improving the safety margin that would have likely avoided the accidents cost anything near what has been expended let alone the value of the life that was lost.

It is the conclusion of this report after reviewing these and many other accident and incident reports that many vessel manufacturers are designing vessels without a full understanding of the forces and dynamics that the vessel is going to be exposed to when those vessels are placed in government service. These are small vessels and in most instances the manufacturer designed their boats for a recreational consumer, not commercial users.

The accident reports document that boat crews are still in some instances not wearing PFDs. PFD use can be a significant factor in survival of the crew. Failure to wear a PFD is likely the cause of the fatality. Use of PFDs in several of the accidents is probably the reason there was not greater loss of life.

Prevention Plan:

If we use past incidents as an indicator we must conclude that accidents of this type will continue to occur unless we take substantial and positive measures to change the manner in which this type of activity is conducted. The following actions should be implemented to avoid these accidents in the future.

- Any of our employees who are planning to conduct any vessel operations that will involve the towing of equipment on a routine basis must be required to perform a hazard analysis before any work involving a vessel towing equipment is accomplished and include the following modifications to their vessels and equipment.

- Any vessel involved in these types of activities must be equipped with a method to rapidly detach from any towed gear. From the analysis of the accidents this is the most important factor and must be employed. One fact that becomes clear and is undeniable is that the crew can not expect to have an adequate amount of time to react before the boat is in a critical position. Whatever method is used to protect the boat from this type accident it must be something that can be deployed in split seconds. Line cutting devices are fine but better than that is a “weak link” in the line and or a “drag” system on the winch that allows the winch to “free spool” line in the case of a hang up without operator control. Employing both, is probably the best system. If you are trying to protect the crew and vessel from a potentially fatal accident it is worth having a system with built in redundancy. “You should always have a back up plan.”

- Rather than using cable to attach the gear, vessels should be equipped with some type of line making it easier to cut. In most instances the gear we are towing is not exerting such a force that only cable will suffice to support the load.

- The crew of the vessel must be prepared to sacrifice their towed equipment. Knowing that, they should design a system that allows them to detach from the equipment and return later, locate and retrieve the gear, e.g. constant GPS locations, painters or lines trailed off of the equipment, possibly with a float attached. The writer cannot design the system. But what can be predicted is that crews involved in towing equipment will, given time, most likely have to abandon that equipment to save the crew and vessel. If our crews begin their analysis based on that predicate then they can design a system for their specific project that should keep them and their vessel safe. Therefore make plans to abandon your gear, and retrieve it after the threat has passed.

- All crews involved in these types of activities must employ these measures in this priority; a “weak link”, of some type, a passive “drag” system on the winches, preferably lines rather than cable and an effective cutting device immediately available.

- If possible attach the equipment to the bow or at least forward of amidships on the beam. If equipment is suspended from the gunwale take measures to maintain even ballast. An inherent part of this discussion is vessel stability. When employees decide that they must tow gear there must be significant thought given to the vessels overall stability, e.g. load, righting arm, and symmetry. Those factors all contribute to the vessels ability to maneuver. In an emergency the vessels ability to maneuver is often the most important factor insuring it’s survival.

- The line supporting the towed equipment should never enter the water higher than the gunwale of the vessel. Design modifications should be taken when possible to have the final attachment point as close to the surface of the water as possible.

- Our crews should avoid trawling down current if possible. When a vessel is moving down current it must increase its speed relative to the speed of the water in order to maintain maneuverability. That extra speed compounds the risk to crew and vessel if the towed gear becomes fouled on the bottom. If vessels must trawl down current it should be a requirement that they will have a reliable tested “weak link” in their attachment to the gear that will release the vessel in case of a hang up.

- The single most important action an operator or crew member can take to increase their personal safety when they board a vessel is to don a PFD. Yet we continue to see personnel refusing to use that safety equipment. The fatality that occurred in the Hudson River incident was most likely the direct result of that individual not wearing a PFD. If that is not the case it certainly was a significant contributing factor to that death.

- When ordering or modifying vessels employees must not assume that the vessel manufacturer fully understands the forces that the vessel and gear will be subjected to. It is imperative that the manufacturer be fully informed of what the vessel will be used for and the exact reason for any modification made in the design.

Suggested Implementation:

- If these recommendations are accepted they should immediately be distributed as a "Safety Alert" with an elevated priority through each Regional Safety Officer to all of the stations that conduct vessel based scientific data collection.

- The information in this report that identifies those key safety issues that should be adopted by our employees when involved in towing various kinds of equipment should be included in the appropriate classes at NCTC. It may be that NCTC could also develop a web based course that would include this information with a test that must be successfully passed by any Motorboat Operators that are going to be involved in these types of activity.

- Although this report documents safety issues with vessels involved in scientific research the conclusions and recommendations apply equally to any vessel towing in moving water. Although the most urgent need for this information is our vessel based scientists, we must insure that this information is available to all of our vessel operators.

- Proven safe designs that are being employed within the DOI must be made available to our employees who are outfitting vessels for these types of activities. This information should be made available on the NCTC web site and the DOI Safetynet.

- Pursuant to Service policy, 241 FW 1, the following actions should be taken:

- The results of this Accident Analysis should be an agenda topic at the next Department Safety Council meeting after approval of this report.(241 FW 1.6, C. 4)

- The results of this Accident Analysis should be presented to the Service, Watercraft Safety Working Group for their consideration as to how the information should be disseminated to Service employees and possible policy amendments.(241 FW 1.6, F, 3)

- Any modification to a standard hull design for purposes of supporting towed scientific equipment should be part of the hazard analysis. That job hazard analysis and the newly outfitted vessel should be subject to a full review before the vessels is put in to service. The review and inspection should be conducted by an individual or team designated by the Regional Safety Officer and the Regional Watercraft Safety Coordinator for the respective Region.

- The Department of Interior Bureaus must no longer accept employees putting themselves and others at risk because of a irresponsible attitude towards the policy of PFD use. The Department must assure that there is accountability for the proper use of PFDs by vessel operators and crew. The intentional failure of employees to comply with department policy concerning the use of PFDs aboard DOI vessels should result in disciplinary action.

- A better system of insuring the completion of accident reports must be designed.

Below is a summary of the comments received concerning the prevention plan for avoiding reoccurrence of these types of accidents. I wanted to include essentially all of the comments received rather than making a subjective decision as to their individual value.

Summary of Prevention Plan Comments Received:

Comments received from Allen Miller, who was a crew member on the USGS boat that sank on the Columbia River in June of 1994.

Bullet 1: I think it may be good to include vessels doing periodic/occasional work as well so that "routine basis" it is not used as a loophole. Crews and vessels not used for regular work of this type may be even more prone to problems on any given trip than crews who tow regularly.

Bullet 2: I couldn't agree more! It may be good to note that while a drag system is a great backup for a weak link system, free spooled cable or line could become tangled in props or impellers. I am not saying we should shy away from drags, just that we should make those using them aware of the potential so they are prepared to employ the system in a way to avoid such problems. As I am sure you know, drag from the current generally keeps the cable away from props, but the possibility of problems should be considered when designing systems.

PFD Bullet: I suggest a recommendation that PFD knives be used when lines are used instead of cables. Even a slow moving vessel suddenly made fast to the bottom can make crew members loose their balance for several seconds. Time retrieving a knife is unnecessary if each PFD is rigged with a proper safety knife designed and used only for that purpose. Of course it would be best for each crew member to have a dedicated PFD so it can be personalized, and the user can be familiar (and hopefully practice) with the PFD and its equipment.
Other:

I think the moving water module needs to be implemented and made to include material related to towing gear. The module should be required for at least the operator of vessels towing gear (if not the crew). As someone who towed over 4000 hours in moving water, and a certified whitewater boatman, I believe that the moving water module would be very valuable. Even if towing was not added to the current moving water module, learning what to do when you encounter a hydraulic or a sweeper, awareness level whitewater rescue info, etc. would at least alert operators of the great power in moving water, and what happens when free movement of the vessel is hindered in a fast current. An alternative would be to use the current module as a starting point to develop an equipment towing module. The incidents covered in your report would be great case studies to use in a class.

Regarding your comments on avoiding cutting corners on equipment and design/engineering: One additional factor I think is worth mentioning is boat displacement. Although displacement alone is no substitute for any of the measures you suggest, it can be a moderating factor. Example: the National Marine Fisheries Service used a 50' vessel on the Columbia River below Bonneville Dam to do exactly the same work with the same gear in the same water velocities that the FWS was doing upriver with a 24' vessel. Having been on both vessels when hung up in rough seas, it was obvious that there was a lot more room for error on the larger vessel. The advantage may be small when a vessel is made fast to the bottom, but is greater when a vessel trawls up something very heavy which is not attached to the bottom (which happened on a number of occasions on the project I was working on). Much of I feel strongly that the vessel I was asked to use was too small for the gear/technique/water velocity combination. To me the ideal situation would be to have the equipment you recommend on a vessel of adequate displacement.

Regarding the overall savings to the department from implementing your recommendations: Given the history of accidents you include in your report, its only a matter of time (under current conditions) until there are additional injuries or fatalities. I am just guessing, but I think potential costs from lawsuits could make the extra costs to implement your recommendations seem small. I know I am preaching to the choir, but I thought I would say it anyway.

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Comments received from Aaron Garcia, Fisheries Biologist, Snake River Office, Ahsahka, ID and Region 1, Watercraft Safety Coordinator. “I think the Service should require additional training and testing for operators who are pulling or pushing something from a boat. I suggest using a computer-based approach. We could amass information about trawling (push-netting, towing, etc.), put it together in a computer presentation, and have a test at the end. It would be informative at the least, and may prevent an accident. This may have to go hand-in-hand with a means to insure operator experience level, though I haven’t thought that one through.”

Comments received from Stew Cogswell, Fisheries Biologist, Green Bay FRO, New Franken, WI. Stew is a lead boating instructor in Region 3 and has substantial experience towing scientific equipment from boats on the Great Lakes.

A Job Hazard Analysis, should be required when this type activity is expected.

There must be an automatic way to detach from the gear or freespool. Manually operated cutting devices are not reliable.

It is very important to insure that the manufacturer of a vessel clearly understands what the vessel will be used for and how any “add-on” equipment might effect vessel stability. It can not be assumed that the manufacturer understands all of these things.

Even though “usually” in lake work the vessel and gear are not being effected by strong currents there is the likelihood of winds and waves. Therefore all vessels conducting towing operations regardless of what bodies of water they operate should be made to adhere to the same standards.

We have to insure that not only the boat operator but the, crew operating the gear understand all of this information.

“The line supporting the gear the gear should never enter the water above the gunwale of the vessel.” There should be a national policy developed for this type activity much like the Service Electroshocking Policy. This would insure that all employees reasonably would clearly understand the issues.

PFDs must be worn at all times. “I think it should come down from on high that this will no longer be tolerated.”

“Please get the word out there! I think a Safety Alert is critical.”

To stop these accidents from reoccurring we need a national policy, training, JHA required and information informing employees of the danger involved with this type of activity. This information could be transmitted to the employees by requiring that it be covered at the annual Project Leaders meetings. The Regional Director and Safety Officer should be directed by DC to make this a priority.

Comments from Tom Edwards, recently retired USGS National Watercraft Safety Coordinator.

“The Accident Analysis looks good. I don’t think I would make any significant changes to the content or format of this report as it stands.”

Comments from Wyatt Doyle, Fisheries Biologist who was operating the vessel that sank on the Missouri River in July of 2002.

“I think you keep it from happening again by having an inspection Process.” All boats doing this type of work should be inspected by a qualified individual. “The fact is guys like us just don’t know until we learn the hard way.”

“We had an electrofishing class at NCTC, I don’t see why you couldn’t have something similar for trawling by someone who knew what they were doing. Even information about nets and terminology would be helpful to us choosing the right kind of gear to use and how to modify it to our needs.”

Comments from Joe Skalicky, Fisheries Biologist, Columbia River FRO, Vancouver, WA. Joe is the principal boat operator conducting fisheries work towing scientific equipment on the Columbia River.

“I agree with the prevention plan but believe that it may fall short.”

Mount a bow or similar type of forward looking sonar. This would alert the crew to changes or structures on the bottom before the gear impacts it. A second inexpensive depth sounder mounted on the bow would work.

I would use a GPS chart plotter with NOAA charts to provide “coarse” depth data. This will alert the crew as to what is ahead as well as providing a navigational aid if visibility becomes restricted or gear is lost overboard.

When operating under power and or in current is is often impossible to determine the depth that the gear is “fishing” with a varying deployment angle and scope. Therefore it would be wise to install equipment that could transmit the actual “fishing” depth to the crew.

Substantial contributions and assistance from Thomas K. Edwards, USGS Watercraft Safety Program Manager, Portland, OR
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