Collisions, Allisions, and Groundings: Clusters of High Risk within the Eighth District

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Introduction

A substantial number of casualties that occur across the nation occur on the waterways within the U.S. Coast Guard's (USCG) Eighth District. Some of these numbers are likely attributed to the size of the District, level of traffic, and the complexity of the Mississippi River and its tributaries. However, if casualties can be reduced within the Eighth District, it may have a measurable impact on the overall number of casualties that occur nationwide. Sixty percent of the Waterways Management Program's performance measures are linked to collisions, allisions, and groundings (CAGs).

In January, 2010 District Eight Waterways Management completed a Marine Casualty Analysis that was the result of the USCG's partnership with the Mid America Regional Quality Steering Committee of the American Waterways Operators. Both USCG and industry members were interested in finding ways to reduce marine casualties. The focus of this research was to explore collisions, allisions, and groundings within the Eighth District over the course of a five year period (2004-2008). Although several variables were considered, geographic position seemed to be a primary factor for casualty occurrence. In identifying geographic areas that were consistently problematic, multi-sector partnerships could focus efforts to lower casualties in those areas. The following research questions were addressed: (1) What geographic areas are problematic? (2) How can government organizations and the maritime industry lower casualties within these areas? The methods used to conduct this research are presented in the following section.

Methods

A mixed methods approach was used for this study. First, secondary data from the USCG's Marine Information for Safety and Law Enforcement (MISLE) database was used to identify 4,285 cases involving CAGs within District Eight during the period from 2004-2008. The data set used for this study included 3,781 of those cases; cases with incomplete information for latitude and longitude within MISLE were eliminated. The geographic position of each case was imported into Google Earth to allow for the identification of geographic areas of high risk. For the purposes of this research, a high risk area was identified when six or more CAGs clustered within one nautical mile during the five year period. Within the high risk clusters, trends pertaining to month incident occurred, year incident occurred, time of day incident occurred, and water level (if applicable) were considered when looking at data points within geographic clusters. These trends were also considered when looking at serious marine incidents within geographic clusters. The focus of this paper is on geographic location of incidents because it seemed to be the most prevalent factor throughout the analysis.

Second, focus groups were conducted with personnel representing the U.S. Coast Guard (USCG), U.S. Army Corps of Engineers (USACE), and the maritime industry to discuss some of the clusters of high risk. An exploratory study addressing why particular areas were more susceptible to casualties lent itself to a focus group approach because there were a multitude of

causal factors and information rich data was needed to understand complex relationships between them. Furthermore, a database that consistently captured the root cause for casualties did not exist. The Chief of Prevention in each of the Eighth District's seven Sectors was given an opportunity to host a focus group addressing high risk areas within their boundaries. Sectors Corpus Christi, Mobile, and Ohio Valley held focus groups from December 2009 through May 2010.[1] One focus group was held in Sectors Corpus Christi and Mobile. Three focus groups were held in Ohio Valley. Marine casualty investigators, river tender officers in charge, and senior program administrators represented the USCG; surveyors and a lockmaster represented the USACE; and towboat captains, port captains, and company executives represented the maritime industry. A transcription of each focus group was developed by a designated note taker. Upon the conclusion of each focus group, the transcription was sent to participants soliciting additional input or changes prior to finalization.

Initially, criterion purposeful sampling was used to select personnel based on familiarization with the geographic areas identified for high risk. Among the personnel representing the maritime industry, stratified purposeful sampling was used to generate involvement from port captains and masters of vessels who transit through the geographic areas. Textual data was analyzed based on the following themes: creating awareness for high risk areas, enhancing preparedness for transiting high risk areas, and alignment of organizational processes.

Findings

Over the course of the five year period, except for 2005, there was a steady increase in CAGs collectively. Groundings drove this trend. Of the 3,781 cases involving CAGs from 2004-2008, there were 1,438 CAGs that clustered geographically into 99 areas throughout the 7 Sectors in District Eight. The distribution of high risk areas across Sectors are conveyed in table 1. The purpose of this table is not to make comparisons across Sectors; certainly volume of traffic and environmental factors change from port to port. Instead, this information can be used to help make decisions on where to first target efforts based on the Sectors with the highest number of casualties. Since performance of the Waterways Management Program is linked to the reduction of CAGs, the emphasis of this research was on identifying areas with the most number of casualties rather than comparing these areas against one another.

Within the 3,781 CAGs occurring in District Eight, 208 cases were documented as Serious Marine Incidents (SMI), as defined in 46 CFR 4.03. Fifty-six percent of these cases involved allisions; the highest number of CAGs occurred in 2005 or 2008 during the months of January and February. Within this data set, SMIs were most frequent during the following time periods: 0500-0700 (12%); 1000-1200 (11%); 1900-2200 (16%).

[1] In Sector Houston Galveston areas of high risk were presented at the NAVOPS Subcommittee Meeting of the Houston Galveston Safety Advisory Committee and the Texas Waterways Operators Association; feedback was solicited from attendees. Based on input from four Captains, recommend the following changes be considered: (1) Reconfiguration of the Freeport Harbor Channel at its junction with the GIWW (MM 395) WHL; and (2) Prioritization for dredging silt in the GIWW (MM 333) WHL at its junction with the Sun Oil Company Canal. There were 75 casualties in the five year period studied at the junction of the Sun Oil Company Canal and the GIWW (MM 333) WHL; as the second largest cluster within the boundaries of Sector Houston Galveston, this accounted for 16% of the casualties. There were 13 casualties in the five year period studied at the junction of the Freeport Harbor Channel and the GIWW (MM 395) WHL; this accounted for 3% of the casualties within the boundaries of Sector Houston Galveston.

Table 1: Distribution of High Risk Clusters

Sector	**CAGs Clustered Geographically**	**Number of Clusters**	**Number of SMIs**
Houston-Galveston	473 (33%)	24	16
New Orleans	280 (19%)	23	29
Ohio Valley	191 (13%)	15	8
Corpus Christi	183 (12%)	8	5
Upper	146 (10%)	14	3
Mobile	101 (7%)	9	4
Lower	64 (4%)	6	2
Total	**1438**	**99**	**67**

In Sector Houston Galveston there were 24 areas with high risk for casualties. Of the 473 casualties within these clusters, 46% were groundings; the highest number of casualties occurred in 2008 during the months of April, October, and December. Within Sector Houston Galveston's boundaries, casualties were most frequent in the following two areas: (1) Gulf Intracoastal Waterway (GIWW) MM 356 West of Harvey Locks (WHL) at the Galveston Railroad Bridge and Bascule Bridge; and (2) GIWW (MM 333) WHL at the junction of Sun Oil Company Canal. The Galveston Railroad Bridge is identified as an "unreasonably obstructive bridge" under the Truman-Hobbs Act and future alteration is expected.

In Sector New Orleans there were 23 areas with high risk for casualties. Of the 280 casualties within these clusters, 49% were allisions; the highest number of casualties occurred in 2004 during the months of January, March, and April. Within Sector New Orleans' boundaries, casualties were most frequent on the Lower Mississippi River MM 209 at Plaquemine Point.

In Sector Ohio Valley there were 15 areas with high risk for casualties. Of the 191 casualties within these clusters, 57% were groundings. Every cluster was found to be within geographic proximity to areas where two or more rivers merge, near locks/dams, or near bridges. Fifty-four percent of the clusters occurred near locks/dams. The highest number of casualties occurred in 2007 and 2008 during the months of February, July, and October. Within Sector Ohio Valley's boundaries, more than 30% of casualties occurred on the Ohio River (MM 939) at Lock and Dam 52, at Lock and Dam 53, or in between the two locks. Sixty percent of the casualties that clustered are in Marine Safety Unit Paducah's area of responsibility.

In Sector Corpus Christi, there were 8 areas with high risk for casualties. Of the 184 casualties within these clusters, 80% were groundings. The highest number of casualties occurred in 2004, 2006, and 2008 during the months of February and March. Within Sector Sector Corpus Christi's boundaries, almost 60% of casualties occurred at the intersection of the GIWW and Matagorda Ship Channel. Based on a query of collisions, allisions, and groundings during 2009 at this intersection, risk was mitigated through changes to the aids to navigation system to alter the intersection for the GIWW and Matagorda Ship Channel.

In Sector Upper, there were 14 areas with high risk for casualties. Of the 146 casualties within these clusters, over 75% were allisions. Findings suggest that almost 50% of the clusters occurred near bridges. The highest number of casualties occurred in 2007 during the months of April, May, and June. Within Sector Upper's boundaries, almost 25% of casualties occurred on the Illinois River (MM 151) in the vicinity of Powerton Lake.

In Sector Mobile, there were 9 areas with high risk for casualties. Of the 101 casualties within these clusters, 62% were groundings. The highest number of casualties occurred in 2004

during the months of March, April, and May. Within Sector Mobile's boundaries, more than 20% of casualties occurred on the Tombigbee River (MM 213) in vicinity of Demopolis Lock and Dam.

In Sector Lower, there were 6 areas with high risk for casualties. Of the 64 casualties within these clusters, 88% were groundings. The highest number of casualties occurred in 2008 during the months of August, September, and November. Within Sector Lower's boundaries, 25% of casualties occurred at the junction of the Lower Mississippi River (MM 819.4) and the Obion River near Tamm Bend and Wrights Point.

The top 12 areas for high risk within District Eight are conveyed in table 2. Placement was based on the top 12 highest numbers for all geographic clusters identified within District Eight.

Table 2. Top twelve high risk areas in District Eight for CAGs

Sector	**Geographic Location**	**CAGs**
Houston Galveston	GIWW (MM 356) WHL – Galveston RR Bridge and Bascule Bridge - Junction of Alternate Route	82
Houston Galveston	GIWW (MM 333) WHL – Junction of Sun Oil Company Canal	75
Houston Galveston	GIWW (MM 351.5) WHL – Junction Texas City Channel – IVO Galveston Bay and Bolivar Roads	53
Ohio Valley – Paducah	Ohio River (MM 939) Lock Dam 52	42
Upper - Peoria	Illinois Waterway (MM 151)	38
Houston Galveston – Port Arthur	GIWW (MM 288.8) WHL – State Route 87 Highway Bridge	31
New Orleans – Baton Rouge	Lower Mississippi River (MM 209) at Plaquemine Pt.	27
Houston Galveston – Port Arthur	GIWW (MM 276.5) WHL – Junction with Neches River	27
New Orleans – Baton Rouge	Junction Atchafalaya River (MM 6.8), Red River, & Lower Old River	24
Mobile	Tombigbee River (MM 116.5) – Coffeeville Lock and Dam	23
Houston Galveston	GIWW (MM 405) WHL – At the Narrow's	22
New Orleans – Baton Rouge	Lower Mississippi River (MM 234) at Highway 190 Bridge	19

Findings were disseminated through focus groups in hopes of identifying why certain areas had seemingly high navigational risk and what could be done to minimize this risk. Themes from the focus groups held in Sector Ohio Valley are conveyed in this section and focused on awareness, preparedness, and organizational processes.[2]

[2] Analysis of focus groups held in Mobile and Corpus Christi are contained in a separate document.

Awareness

Participants did not seem surprised with the areas identified as having high risk. Due to the presence of man-made structures or the impacts of hazardous environmental conditions, participants expressed agreement in identifying the areas presented as having high risk. One participant described the area around Paducah in the following way, "It's a hard area. You have four rivers (Cumberland, Ohio, Mississippi, and Tennessee) and they all impact each other."

While participants representing the maritime industry were seasoned masters/pilots, the benefit of having these areas identified on electronic charting was mentioned. With the hazardous environmental conditions in these areas, participants thought it would be helpful for a warning to pop up on electronic charts, like a "deer crossing sign", when coming near these trouble spots. Participants conveyed that new, inexperienced pilots may not look at a Notice to Mariners or understand the conditions interacting in a particular area. The following was conveyed during the focus group, "With the changing dynamics in this area it would take a lifetime to teach someone new. I have to experience it myself so I know how much is on the gage." The USACE updates charts monthly. Some industry personnel conveyed uncertainty regarding the cycle in which their companies update their charts.

One participant made a point to mention that there is a need for all companies to be realistic about the drafts being carried. The key is to load a tow to transit safely throughout all parts of the river on the trip. Challenges are recognized because a tow can be loaded days in advance and the river conditions can change much in a short period of time. This was conveyed by a participant in the following way, "When you start loading a barge 7-14 days out, you may be transiting 700 miles and when you load it they may predict good weather and then it changes." The general perception was that operators did their best to keep up with draft restrictions which can change depending on the river stages. As one focus member said, "We don't like to run aground. We don't make any money that way." Another participant described the "shuffle" that often occurs when approaching Lock and Dam 52 on the Ohio River near Paducah, "If you have 15 barges and 14 of them are too heavy, the tow is rearranged. Give barges to another tow." Another participant conveyed that his company will hold a tow when necessary until good water is certain, but money is lost in doing so and not all companies practice this. A grounding occurred the week before the focus group and involved a tow pushing multiple, loaded barges in the vicinity of MM920 on the Ohio River. One barge was loaded to 10.6' and it ran aground. My sense from discussions with personnel at MSU Paducah was that this boat operator should not have attempted this portion of the river with that load. Participants perceived strong internal communications to ensure boat operators were aware of trouble spots and water levels on a day-to-day basis. Several participants noted that industry communications greatly improved over the last several years, companies focused on lessons learned, and situational awareness was being addressed at Seamen's Church Institute training. However, not all towboat masters/operators attend training at Seamen's Church Institute.

While participants conveyed that prevention techniques have improved with better technology to communicate (i.e. email, voice, electronic charting), there seems to be much variation in the formality of risk assessments being conducted between different companies. Some companies rely on a very systematic approach to "spark discussion." One participant suggested why the analysis is important, "Risk analysis is a daily process because it is an ever changing situation." Others are seemingly less formalized and rely on the boat operator to call a port captain. "If the boat operators feel uncomfortable, they call the port captain. In those situations port captains go out and get on boats." This is a sensitive issue with industry because

increased drafts are linked to increased revenues. A participant conveyed, "Here is where we are – we error on the side of caution. We are talking about hundredths of an inch. Can we float it over an area?" Another participant said, "There are so many variables. It's the water level, the captain, the environment. It's a roll of the dice." The issue of risk assessments and how it relates to discussions involving barge carrying limits is worthy of further consideration.

Preparedness

Within Sector Ohio Valley's boundaries, more than 30% of casualties occurred on the Ohio River (MM 939) at Lock and Dam 52, at Lock and Dam 53, or in between the two locks. Participants from the Sector Ohio Valley focus groups conveyed that the approach wall to Lock and Dam 52 needed lighting. This is a wicket dam and is used only during periods of low water. MISLE data was used to confirm that a significant number of incidents in the vicinity of Lock 52 were allisions with the lock wall. It is particularly difficult for tow operators pushing empty barges at night to see the end of the upper long wall as they make their approach to the lock. As a result of the focus groups, the USACE installed flood lights on shore and a single white light along with reflective tape on the bull nose to better mark the location of the approach wall in June 2010. Having the ability to clearly distinguish the end of the wall from the background during darkness could potentially prevent lock allisions and enhance vessel safety on the Ohio River.

Much of the discussions focused on the criticality of buoys on the river and the need for dynamic response to reposition buoys during extreme low/high water. When speaking to the Coast Guard's response in areas of high risk an industry representative conveyed, "Need to use resources in a smarter way." There was a perceived need for more timely response to hazardous conditions and buoy replacement. One participant conveyed, "Communication is not the problem, it is the response to communications that is the problem." Representative for the maritime industry suggested that flexibility in Coast Guard river tender schedules may allow for more effective response. "We should prioritize use of buoy tenders in areas where buoys are most frequently knocked out." While participants recognized the inabilities for continuous 24/7 response, they perceived long response times for correcting missing/inaccurate aids to navigation, inflexible unit schedules, and seemingly similar frequencies for managing aids to navigation in different rivers with widely varying hazards. For example, participants perceived the Cumberland River (1 of 8 clusters) to be visited with the same frequency as the Ohio River from MM920.5 through MM981.6 (6 of 8 clusters). One participant conveyed, "The Coast Guard fleet is not in the right place." As another participant stated, "Scheduling and how to do it is an art and a science. There is a difference between coastal and river areas but also within the river areas themselves. It is a juggling game." Co-locating river tenders to the Paducah area may allow for more effective resource management. Cutter response time to reposition aids in the areas posing highest risk was identified by industry representatives at each of the three focus groups. Shifting the homeports of USCGCs OBION, CHIPPEWA, CIMARRON, and CHENA would reduce transit times to assigned areas for servicing Aids to Navigation by nearly half.[3] In addition, co-location would generate flexibility to shift or realign personnel and resources as needed to ensure effective response in the areas with highest risk.

Participants recommended the identification of conditions that trigger fast action response from the Coast Guard with regards to waterway maintenance and priority status in scheduling. "One challenge is discrepancy response. Not all aids are created equally." Sector Ohio Valley is

[3] See Memorandum from Commander, Sector Ohio Valley dtd 8 Nov 2007

engaging in additional discussions on effective prioritization of response to aid discrepancies, including an update to the Waterways Action Plan with response triggers. Certain areas were identified as needing priority in discrepancy response: Owen's Island coming out of the Tennessee River near Livingston Point, Shawnee Town on the Ohio River, Little Chain Bar on the Ohio River near Metropolis, Post Creek on the Ohio River above L/D 53 going into the buoy line, Metropolis Bar below L/D 52, and American Bar on the Ohio River below the new Olmsted Lock. As low or high water conditions are projected, it may be beneficial to have river tenders positioned in a priority area. "There is a need for buoy tenders to be proactive and be where they are needed before the situation occurs." Relocation of river tenders to Paducah would allow for easier access to high risk areas.

Participants conveyed a need for LED lights to be used on bridges. The perception was that this type of light would extinguish less frequently. One participant conveyed that the Natchez Chase Bridge Light was not bright enough (Tennessee River MM 237). Apparently the problem had been reported and it had yet to be fixed. Upon conclusion of the focus group, this information was passed to the bridge administrator for this area. Maintenance on connections, wiring, and lenses was conducted at the end of April to ensure lighting met the 2,000 yard requirement. Other participants also conveyed a need for mariners to do a better job with reporting bridge light discrepancies.

Processes

Discussions among participants focused on communications in two areas: (1) between the USCG and USACE pertaining to conveying the location of groundings and a desire for dredging operations; and (2) between the USCG and maritime industry pertaining to aid discrepancies. First, it is helpful for the USACE to know where groundings occurred because they can use this information to help in making decisions regarding dredging prioritization. Currently, there is not a protocol established to link this information. At best, this information is passed via email and a mile marker is provided for the location of the grounding. The USACE needs more accurate information regarding the position of the initial grounding.[4] It is recommended that USCG field units develop a protocol for conveying casualty information to respective USACE surveyors.

There were no perceived problems with regards to boat operators conveying problems to the Coast Guard. The following recommendations were made concerning technology and communication: (1) centralization of BNMs; (2) a "one-stop-shop" for information to mariners with potential for local committees to have access to pass information as well; (3) passing information regarding when a unit last ran a particular section of the river and set buoys; and (4) passing schedules of tenders.

In general, participants representing the maritime industry perceived the threshold for reporting casualties to be too low because it has not been adjusted for inflation since its inception. Comments were made that it is easy for the $25,000 threshold to be reached – "it is one cracked barge." There was a sense within the group that this was a cost of doing business.

Enhanced consistency within the MISLE database would allow for improved analysis in the future. Information that is not consistently entered into MISLE but would be helpful for future analysis includes the following: horsepower of the tug involved in the casualty, tow size

[4] Based on this study, areas for high risk of groundings were communicated to USACE surveyors working within the boundaries of Sector Ohio Valley, Mobile, and Corpus Christi. Efforts are underway to disseminate findings to a POC at the USACE Headquarters to distribute to all surveyors within the dredging community.

and configuration, identification of the vessel that grounded, draft of grounded vessels, water height, operator experience, and placement of tow within channel (for groundings).

Conclusion:

Within each sector, stakeholders are connected in different ways. Whether it is through federal advisory committees, marine incident summits, harbor safety committees, port coordination teams, or other groups, there are various opportunities for stakeholders to engage in discussions about areas that have been identified as having the highest risk for casualties. Marine casualties are a complex problem, and it will require organizations to reach across boundaries to identify resolutions. Identifying areas of high navigational risk may help inform decision making at the local levels; efforts were made to convey findings to various audiences.[5] While there are various ways in which this data can be used, some applications for government entities include the following: connection to USACE project risk assessments, coverage in Waterways Action Plans, WLR replacements/acquisitions, and dredging priorities for the USACE.

Much fruitful information was gathered during these discussions. When asked about the benefits of meeting one participant conveyed, "Now we know what others are going through and what others are working on." In hearing about other projects and challenges, participants seemed to gain a better understanding of one another. "There is a benefit in meeting face to face. Now I see what everyone does and can identify issues that others don't know about." Some tangible items have been identified in terms of moving forward. Various Coast Guard personnel are engaging in additional discussions regarding the prioritization of response to aids to navigation discrepancies. The Army Corps of Engineers is intending to use the data to support continued dredging or promote new dredging in high risk areas where casualties are attributed to shoaling. The Coast Guard is looking to see if process improvement can be made in reporting aids to navigation discrepancies. The maritime industry may want to engage in further discussions regarding navigational risk assessments, updates to electronic charts, and barge carrying loads. It is through collaboration that government entities and the maritime industry will develop solutions for minimizing casualties in high risk areas.

[5] Conference presentations include the following: American Waterways Operators (AWO) Regional Quality Steering Committee, AWO Midwest, Ohio Valley, and Southern Regions Joint Annual Meeting, Inland Waterways Conference, Eighth District Prevention Conference, Eighth District Waterways Conference, and NAVOPS Subcommittee Meeting of the Houston Galveston Safety Advisory Committee.