JOINT MEETING OF COASTAL & INTERREGION SAFETY COMMITTEES

The American Waterways Operators

January 22-23, 2013
The Westin New Orleans Canal Place
100 Rue Iberville, New Orleans, LA

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The American Waterways Operators

The national advocate for the tugboat, towboat and barge industry

Joint Coastal and Interregion Safety Committees Meeting

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Tuesday, January 22, 2013
1:00 p.m. – 5:00 p.m.

Safety Briefing
Ms. Mary McCarthy, Canal Barge Company, Inc.

Welcome and Introductions
Mr. Matt Baker, Moran Towing Corporation

Coastal Safety Committee Chairman's Remarks
Mr. Matt Baker, Moran Towing Corporation

Lessons Learned
Mr. Paul Hassler, JB Marine Service, Inc.

Implementing the Recommendations of the Falls Overboard Quality Action Team
Mr. Jim Smith, Magnolia Marine Transport Company

Lessons Learned
Mr. Jeff Slesinger, Western Towboat Company

Lessons Learned
Mr. Fred Nyhuis, Marathon Petroleum Company, LP

Lessons Learned
Mr. Matt Lewis, Kirby Corporation

Report on the Work of the AWO Safety Statistics Working Group
Mr. Fred Nyhuis, Marathon Petroleum Company, LP

AWO's Changing Role in RCP Auditor Training and Certification
Mr. Tom Allegretti, The American Waterways Operators
Mr. Chris Parsonage, Quality Auditing, LC

Lessons Learned
CAPT John Arenstam, Chief, Western Rivers

Keynote Address: Risk Management
Dr. Barry Strauch, National Transportation Safety Board

Wednesday, January 23, 2013
8:00 a.m. – 12:00 p.m.

Safety Briefing
Mr. Matt Stump, Andrie Inc.

Introductions
Mr. Jason Adams, Ingram Barge Company

Interregion Safety Committee Chairman's Remarks
Mr. Jason Adams, Ingram Barge Company

Review of Current AWO Issues, Challenges, and Work
Mr. Tom Allegretti, The American Waterways Operators

Establishing a Culture to Achieve Excellence in Safety
Mr. Will Kraft, W&M Kraft, Inc.

Lessons Learned
Mr. Matt Baker, Moran Towing Corporation

Strategic Dialogue Session: Northwestern University Split-Sleep Research Results
Ms. Jennifer Carpenter, The American Waterways Operators

Analysis of Towing Vessel Fuel Spill Statistics
Mr. Jason Adams, Ingram Barge Company
Mr. Matt Baker, Moran Towing Corporation

Lessons Learned
Mr. Brian Callaway, American Commercial Lines, Inc.

Workboat Engineer Solutions for the Future
Mr. Jeff Slesinger, Western Towboat Company

Meeting Review and Discussion
Mr. Jason Adams, Ingram Barge Company
Mr. Matt Baker, Moran Towing Corporation

Safety Meeting Attendees

AccuTrans, Inc.
John Baker
Toni Macksey

AEP River Operations
Gary Johnson
Jeff Keifer
Tim Sizemore

Amherst Madison, Inc.
Bill Barr

Andrie Inc.
Matt Stump

Blessey Marine Services, Inc.
Andy Norval

BP Shipping USA
Aled Roberts

Canal Barge Company, Inc.
Ed Chandler
Taylor DuChaine
Mary McCarthy
Tom Smith
Joe Tyson

Cenac Marine Services, LLC
Tim Moore
Andre Waddell

Chem Carriers, LLC
Doug LeBlanc

Cooper Marine & Timberlands Corp.
Greg Klix
Randy Vick

D & S Marine Service, L.L.C.
Patrick McDaniel

Dann Ocean Towing, Inc.
Randy Trapp

Economy Boat Store
Mike McCaskill

Edoc Systems Group Ltd
Ged O 'Connell
Paul Traplin

Express Marine, Inc.
Keith Kirkeide

Florida Marine Transporters, Inc.
Kimberly Hidalgo
Heather Williams

Foss Maritime Company
Susan Hayman

Genesis Marine, LLC
Dennis Mendenhall
Brian Teste

Golding Barge Line, Inc.
Jonathan Brock

Henry Marine Service, Inc.
Allen Henry
Sheldon Morgan

Higman Marine Services, Inc.
John Costello

Hile Group
Julie Hile

Houston Marine Training Services
Julie Linn

Hunter Marine
Donnie Hall

Ingram Barge Company
Jason Adams

Inland Marine Service
Cathy Hammond

Ivy Marine, LLC
Pat Folan

JB Marine Service, Inc.
Paul Hassler
David Heyl
Karen Shoot

John W. Stone Oil Distributor, LLC
Johnny Oelkers

Kirby Corporation
Dave Riches

Kirby Inland Marine, LP
Zach McGavitt

Kirby Offshore Marine, LLC
Jeff Parker

La Carriers, LLC
Nessie Pierce

Luhr Bros., Inc.
Bill Klingel

Magnolia Marine Transport Company
Jim Smith

Marathon Petroleum Company, LP
David Naramore
Fred Nyhuis

Maritime License Training Company
Bob Russo

Maritime Serivces Group of Louisiana, LLC
Tom McWhorter

Marquette Transportation Company, Inc.
Miranda Calendar
Jeremy Dyer
Ladonna Esper
James Horton
Steve Myskowski

McAllister Towing
Allen Aden
Buckley McAllister

McDonough Marine Service
Shawn Norman

McNational, Inc.
Ron Lauder

Moran Towing Corporation
Matt Baker
David Olson

Moxie Media, Inc.
Bob Stout

National Transportation Safety Board
Barry Strauch

Octopus Towing, LLC
David Dunn

Phillips 66 Company
Brian Blowers

Progressive Barge Line, Inc.
Frances Boffone

Quality Auditing, LC
Chris Parsonage

Reinauer Transportation Company
Scott Townsend

Salyers Solutions, LLC
Jo Ann Salyers

Sause Bros.
Rick Kimberly

SCF Marine Inc.
Stephen Colby
Timothy Robinson

Seabulk International, Inc.
Doug Carlson

Settoon Towing, LLC
Chris Smart

SGS Petroleum Service Corporation
Jo Ann Fridge
Jimmy Horn

STS Supply & Training, Inc.
James Foster

T & T Marine Salvage, Inc.
Kelly Teichman

Team Services, LLC
Bob Williams
Jim Fletcher

The American Waterways Operators
Tom Allegretti
Jennifer Carpenter
John Harms
Lynn Muench
Mark Wright
Sarah Young

The Shearer Group, Inc.
Ed Shearer

The Vane Brothers Company
Tim Sell

TradeWinds Towing LLC
Ryan Babcock
Rachel Smith

Turn Services, LLC
Placito Miceli
Frank Morton
Ginny Morton
Bob Mueller

Upper River Services
Doug Hosszu
Molly Isnardi
Lee Nelson

United States Coast Guard
John Arenstam
Roy Murphy

W&M Kraft, Inc.
Will Kraft

Water Quality Insurance Syndicate
Ron Borison

Wood Towing, LLC
Kelly LeSaichere
John Madere
Sarah Wood Ham

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Lynn M. Muench
Senior Vice President – Regional Advocacy

January 10, 2013

MEMORANDUM

TO: AWO Interregion Safety Committee Members

FROM: Lynn M. Muench

RE: 2012 Interregion Safety Committee Summer Meeting Minutes

The AWO Interregion Safety Committee held its 2012 summer meeting in St. Paul, MN on August 7-8. The meeting was held in conjunction with the summer meeting of the AWO Midwest and Ohio Valley regions.

The meeting was opened by AWO Interregion Safety Committee Chairman Jim Smith, Magnolia Marine Transport Company. Following introductions and after thanking the sponsor of the evening's reception, Turn Services, LLC, Mr. Smith told the committee that he had come to the end of his two-year term as chairman. After thanking the committee for their work to improve industry safety, he announced that he was nominating Vice Chair Jason Adams, Ingram Barge Company, to replace him. Mr. Adams was unanimously elected by the committee.

Mr. Adams thanked the committee and told them that it is his intention to invigorate the committee's meeting agendas, including by increasing lessons learned presentations. He also reported that he and the Coastal Safety Committee Chairman Matt Baker, Moran Towing Company, had attended the most recent AWO Executive Committee, and said that the meeting had shed light on how the AWO safety committees can inform and help to achieve the association's efforts to lead the industry on safety.

Next, Mr. Adams introduced AWO President & CEO Tom Allegretti, who reviewed current AWO issues, challenges, and work for committee members. He was followed by Matt Stump, Andrie Inc., who gave a lessons learned presentation on a fuel spill incident that resulted in the development of a new Management of Change program. Mr. Adams then introduced Will Kraft, W&M Kraft, Inc., who discussed how companies can establish a culture to achieve excellence in safety.

Mr. Kraft's presentation was followed by AWO Southern Region Chairman Frank Morton, Turn Services, LLC, who told the committee how his company has created a culture of safety. Bob Mueller, also of Turn Services, expanded on Mr. Morton's remarks with a lessons learned presentation describing the company's Triple Crown Safety Awards program, which rewards vessel crews that operate without incident with cash and prizes.

The final speaker of the day was Rick Dunn of SeaRiver Maritime, Inc., who gave a presentation on the continuous improvement process.

The next day, Mr. Adams began by introducing AWO Senior Vice President – Regional Advocacy Lynn Muench, who updated the committee on Goal 2 of *AWO 21*, the association's strategic plan, to "lead and support AWO members in continuously improving safety, security and environmental stewardship." She discussed how the safety committees can help achieve Goal 2 objectives.

She was followed by Tim Sizemore, AEP River Operations, who gave a lessons learned presentation on a fall from height. Mr. Adams then introduced the morning's keynote speaker, Robert Henry of the National Transportation Safety Board, who discussed the NTSB's work to prevent distracted operations.

Next, Doug Hosszu of Upper River Services, Inc., described the lessons learned from a heat stress incident that led to a fall overboard. He was followed by U.S. Coast Guard CDR Lee Boone, MSU-Huntington, who discussed the Towing Vessel Bridging Program from a field commander's perspective. Mr. Allegretti then gave a presentation on AWO's changing role in training and certifying auditors of the AWO Responsible Carrier Program.

Mr. Allegretti was followed by Mary McCarthy, Canal Barge Company, Inc., who delivered a lessons learned presentation on Canal's experience transitioning their Vessel Response Plan to the Coast Guard's VRP Express software. She was followed by Julie Hile, Hile Group, who updated the committee on the status of the AWO Safety Statistics program.

Mr. Adams then announced that he and Mr. Smith would be facilitating a group discussion about how the Interregion Safety Committee can help achieve Goal 2 of *AWO 21* and the recommendations of the Task Force on the Future of AWO Safety Leadership. Mr. Adams also asked for feedback on the meeting. The feedback offered by the committee included:

- Schedule the safety committee meetings to coincide with Towing Vessel Safety Committee and other safety meetings.
- Explore the possibility of streaming, or recording and posting on the AWO members-only website, the safety committee meetings for those who cannot attend.
- Involve the senior management of AWO member companies in safety committee meetings.
- Lessons Learned:
    - Explore the use of webinars to share lessons learned presentations and other high-priority safety information.
    - Create a library of lessons learned presentations for fatigue and falls overboard incidents on the AWO members-only website.
    - Request that lessons learned presenters create one-page summaries of their presentation to post to the website.
- Safety statistics:
    - Post finalized quarterly safety statistics from Hile Group to the AWO members-only website.

    - Consider providing AWO regional chairs with a list of members in their region that do not submit safety statistics so that they can conduct outreach.
    - Ms. Hile noted that approximately 40 AWO member companies, out of 350, intermittently report safety statistics.
- Helping to implement the recommendations of the National Quality Steering Committee's Falls Overboard QAT:
    - Create a library of falls overboard-related lessons learned presentations, and a one-page summary of each presentation, on the AWO members-only website.
    - Explore additional methods to communicate falls overboard-related lessons learned presentations, including via webinars.
    - Present the Falls Overboard QAT report at inland Coast Guard units.

For further information on the meeting, please contact Lynn Muench at (314) 446-6474 or at lmuench@vesselalliance.com, or Caitlyn Stewart at (703) 841-9300, extension 262, or at cstewart@vesselalliance.com.

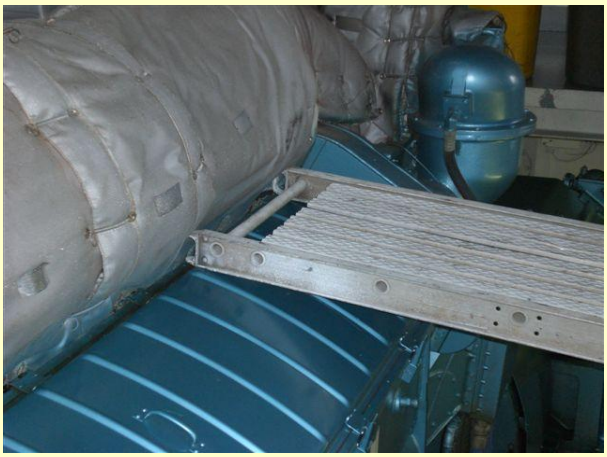
Next Meeting: The next meeting of the Joint Safety Committee will be a joint meeting with the Coastal Safety Committee on January 22-23, 2013, in New Orleans, LA.

Lessons Learned:
Fall From Height

American Waterways Operators Interregion Safety Committee Meeting August 2012

Background

The Chief Engineer of an inland towing vessel was painting over the center engine on the ceiling in the upper engine room, working from an unsecured catwalk. Initially wearing fall protection equipment, the Chief made a number of trips across the catwalk without incident.



Incident

The Chief prematurely unhooked his fall protection equipment before walking across the unsecured catwalk a final time to finish painting. When he stepped from the engine onto the catwalk, the catwalk slipped, resulting in a fall from less than six feet to the engine room floor.

Analysis

The most significant contributory factors to the incident were found to be training deficiencies, such as:

- Inadequate safety briefings
- Maintenance personnel making a routine practice of using fall protection equipment alone, in direct conflict with buddy system procedure
- Maintenance personnel making use of catwalks without securing equipment in place
- Employees not fully understanding the significance of choosing a proper anchor point

In addition, the company made incidental discoveries that its fall protection equipment was not properly inspected, additional language was needed to clarify intent of its policies, and procedures needed to be developed for addressing exposures not defined in its policies.

Corrective Actions

The company set up a Unified Event Analysis Team and immediately issued communications to all vessels in its fleet explaining the incident and establishing interim changes to catwalk usage and buddy system procedure.

Immediate refresher training was conducted onboard each vessel, and refresher training specific to engine room operations was conducted shoreside.

The company also initiated its Management of Change Policy to direct necessary changes to its policies and procedures.

Lessons Learned:
Management of Change

American Waterways Operators Interregion Safety Committee Meeting August 2012

Background

The Chief Engineer of a Great Lakes towing vessel decided to replace a flexible hose in a fuel line on a tank barge with a rigid pipe, without consulting anyone else. His reasoning was that he wanted to install something more secure because the location of the hose made it subject to damage and its age was uncertain. For the next three weeks, the vessel experienced temperature swings between 40 and -5 degrees Fahrenheit.

Incident

Three weeks after the Chief installed the pipe, the vessel crew noticed fuel on the deck of barge and immediately responded. The Coast Guard was notified, the barge was docked and area inspected to determine the cause of the release. Approximately 350 gallons of diesel fuel was released onto the deck of the barge and into the water.

Analysis

The spill resulted from a crack that formed at the threads of the recently installed rigid pipe. It was determined that the causal factors of the incident were:

- The pipe was too long for the location, causing a side load at the 90-degree elbow
- The threading work was substandard
- Large temperature fluctuations combined with moisture
- The change was not properly managed

The Chief performed the change using parts he had on hand without investigating why the flexible hose was utilized in the fuel line and without obtaining any approval, believing that it was an in-kind or like replacement. The company found that it did not have a robust Management of Change program and lacked a clear, well-understood definition of change.

Corrective Actions

The company developed a detailed Management of Change program, discussing and refining it at its annual company meeting. The new Management of Change program includes:

- Clear and concise definitions, including a definition of change
- Defined roles and responsibilities
- Electronic means of requesting change and recording keeping
- Deadlines for making comments on and approving requests and completing changes

Lessons Learned:
Heat Stress

American Waterways Operators Interregion Safety Committee Meeting August 2012

Background

The lead deckhand of an inland towing vessel began his watch with a safety meeting to discuss the hazards of heat stress. At the time of the incident, the towing vessel was transporting two barges upriver to an unload facility. The temperature was 84 degrees Fahrenheit, with a heat index of 92.6 degrees and humidity of 76 percent.

Incident

As the tow neared the dock, the lead deckhand walked out to the head of the tow. During this walk he began to feel lightheaded. Upon reaching the head, the deckhand bent over to pick up the line and fell overboard, landing between the dock and the barge. He was uninjured and able to swim to the riverbank.

Analysis

After the incident, the deckhand requested to leave the vessel for the day. The following day, he continued to feel ill and went to the emergency room, where he was diagnosed with heat exhaustion and received treatment. Because the deckhand had worked for several days previously in temperatures well above 90 degrees, it was the opinion of the attending physician that he was already suffering from heat stress before his watch began on the day of the incident.

The company determined that following the incident, the master of the vessel did not make arrangements for the deckhand to receive a medical evaluation as he should have. Additionally, the employee should have been provided transportation to a medical facility and should not have been allowed to return to work before passing a physical exam.

Corrective Actions

The company found that changes to the company culture regarding falls overboard were needed. The company reiterated the importance of following proper fall overboard response and reporting procedures to its crew members. The company also determined that, while the ultimate responsibility is with the master of the vessel, it is critical that deck crews monitor each other for signs of heat stress during periods of high heat and humidity. The company educated its crew members about the signs and symptoms of heat stress.

AWO JOB DESCRIPTION

Job Title:	**Director – Safety**	**Incumbent:**	**Vacant**
Supervisor:	**Thomas Allegretti**	**Supervisor Title:**	**President & CEO**

Position Summary: This position is responsible for leading, managing and guiding AWO's effort to promote continuous improvement in safety and environmental performance throughout the tugboat, towboat, and barge industry.

Major Responsibilities:

Major Responsibility #1: Act as the intellectual leader and proactive advocate of safety and environmental performance for the tugboat, towboat and barge industry

Major Responsibility #2: Implement, manage and guide the ten year vision for industry safety and environmental performance as that is detailed in Goal 2 of *AWO21*

Major Responsibility #3: Lead, manage and guide the successful transition of AWO members from compliance with the voluntary industry standard of the RCP to the regulatory standard of Subchapter M

Major Responsibility #4: Manage the administration of the Responsible Carrier Program

Major Responsibility #5: Lead, manage and guide the AWO safety committees to ensure their significant contribution to the accomplishment of the objectives and tactics of Goal 2 of *AWO21*

Major Responsibility #6: Coordinate the work of the safety committees, the Accreditation Board, and the national and regional components of the Coast Guard-AWO Safety Partnership to ensure a cohesive program that is focused on the industry's most significant safety and environmental performance goals

Major Responsibility #7: Administer the AWO Voluntary Safety Statistics Program and manage its transition to the mandatory safety statistics tracking and reporting program approved by the Board of Directors

Minimum Qualifications: Strong leadership skills. Experience and proficiency in project and volunteer management and group facilitation. Excellent writing skills and public speaking capability. Ability to analyze and interpret data and statistics and synthesize their essential results. Experience in marine safety and operations a plus. Bachelor's degree.

Minimum Experience:

☐ 0-3 Years ☐ 3-5 Years ☒ 5+ Years

☐ Other (please explain)

_____ _____

Employee Signature Supervisor Signature

_____ Updated: July, 2012

Human Resources Signature

SAFETY DOCUMENTS

2012 Year-End AWO Safety Statistics

2012 Year-End AWO Safety Statistics

January 2013

ıcident Rates by Incident Category and by Sector

	Recordable Injuries	Lost Time Injuries	Fall Overboards	Fatalities
Canal	1.08	.16	.12	0
Coastal East	1.54	1.06	.11	0
Coastal Harbors	2.25	2.03	.05	.05
Coastal West	1.96	.83	.08	0
Fleets	2.48	1.05	.44	.03
Inland Dry	2.11	1.14	.13	.01
Inland Liquid	1.08	.62	.19	0

2012 Total Incident Rates by Incident Category and by Sector*

*rates	Recordable Injuries	Lost Time Injuries	Fall Overboards	Fatalities
Canal	.76	.14	0	0
Coastal East	1.47	.83	.10	0
Coastal Harbors	3.15	2.56	0	.04
Coastal West	2.88	1.16	.06	0
Fleets	2.31	1.03	.44	0
Inland Dry	2.12	1.20	.09	0
Inland Liquid	1.20	.63	.12	0

* Includes *preliminary* 2012 Q4 numbers (25% of sample reporting as of 1.9.13), Canal Sector numbers represent Q3 only

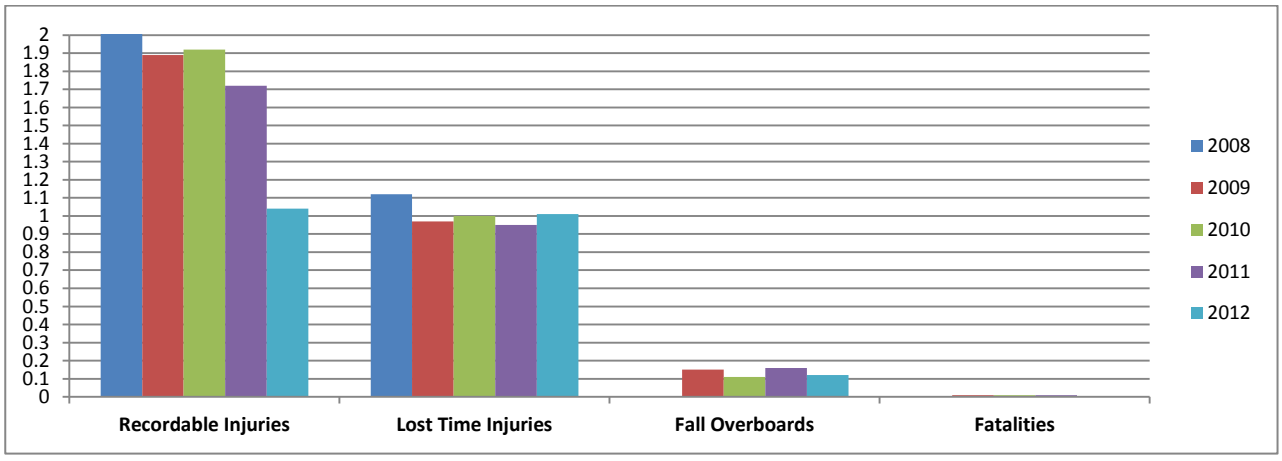
Notes on Two-Year Comparison

- Canal- [Comparison to Q3 2011- RI: 1.03, LTI: .11, FO: .11, Fatality: 0] decrease in Recordable Injuries and Falls Overboard
- Coastal East- slight decrease across the board
- Coastal Harbors/West- increase in Recordable and Lost Time Injuries
- Fleets- decrease in recordable and Lost Time Injuries
- Inland Dry- slight increase in Lost Time Injuries,
- Inland Liquid- increase in Recordable Injuries, decrease in Falls Overboard

Comparison of 2010-2012 Total Incident Rates by Incident Category

	2010	2011	2012*
Recordable Injuries	1.92	1.72	1.04
Lost Time Injuries	1.00	.95	1.01
Falls Overboard	.11	.16	.12
Fatalities	.01	.01	.001

* Includes *preliminary* 2012 Q4 numbers (25% of sample reporting as of 1.9.13), Canal Sector numbers represent Q3 only



SAFETY DOCUMENTS

National Quality Steering Committee

Coast Guard-AWO Safety Partnership
Initiatives Completed or Underway
January 2013

National Quality Steering Committee

Towing Vessel Crew Fatalities Quality Action Team *(completed)*
Tank Barge Transfer Spills Quality Action Team *(completed)*
Towing Vessel Boarding Program Quality Action Team *(completed)*
Major and Medium Tank Barge Spills Quality Action Team *(completed)*
Bridge Allision Work Group *(completed)*
Towing Safety Working Group *(completed)*
Quality Action Team on the Safe Management of Crew Travel Time *(completed)*
Crew Endurance Management Working Group *(completed)*
Reducing Fall-Overboard Crew Fatalities *(completed)*
Towing Vessel Inspection Bridging and Implementation Team (BAIT) *(in progress)*

Mid-America Regional Quality Steering Committee*

Pollution Prevention Regulations Study *(completed)*
Inland Towing Vessel Guide to Federal Oil Transfer Procedures *(completed)*
River Crisis Action Plan *(completed)*
Cooperative Towboat Examination Program *(completed)*
Aids to Navigation Quality Action Team – Upper Mississippi, Illinois and Missouri Rivers *(completed)*
Aids to Navigation Quality Action Team – Ohio, Tennessee, Monongahela, Allegheny, Cumberland and Tombigbee Rivers *(completed)*
Barge Fleeting on the Mississippi River Quality Action Team *(completed)*
Recommended Practices for Bunker Barges *(completed)*
Regional Examination Center Consistency Quality Action Team *(completed)*
Barge Inspection Consistency Quality Action Team *(completed)*
Downstreaming Quality Action Team *(completed)*
Industry Orientation Modules Quality Action Team *(completed)*
Gulf Intracoastal Waterway Aids to Navigation Quality Action Team *(completed)*
Streamlined Inspection Process Quality Action Team *(completed)*
Waterways Action Plan *(completed)*
Eighth District Casualty Quality Action Team *(in progress)*
Outreach, Education and Training Quality Action Team *(in progress)*
Tracking CDC Barges without IRVMC Quality Action Team *(in progress)*
Casualty Reporting Quality Action Team *(in progress)*

Atlantic Region Quality Steering Committee

Hurricane Preparedness Plan Quality Action Team *(completed)*
Visibility Standards for Pilothouse Personnel Quality Action Team *(completed)*
Industry Training and Orientation Program Quality Action Team *(completed)*
Port Coordination Quality Action Team *(in progress)*
Fatality and Casualty Data Analysis Quality Action Team *(in progress)*
Atlantic Fairways Quality Action Team *(in progress)*
Port Access Route Study Quality Action Team *(in progress)*

*The Mid-America Regional Quality Steering Committee was created from the merger of the Midcontinent Region QSC and the Southern Region QSC in August 1998.

Pacific Region Quality Steering Committee

Towing Industry Incident Reporting System Quality Action Team *(completed)*
Vessel Safety Alerts: Lessons Learned Information Exchange *(completed)*
Crew Alertness Quality Action Team *(completed)*
Pacific Region Vessel Casualty QAT *(in progress)*

Other Initiatives

Regional Risk Assessment of Petroleum Transportation on the Waters of the Northeast United States *(completed)*

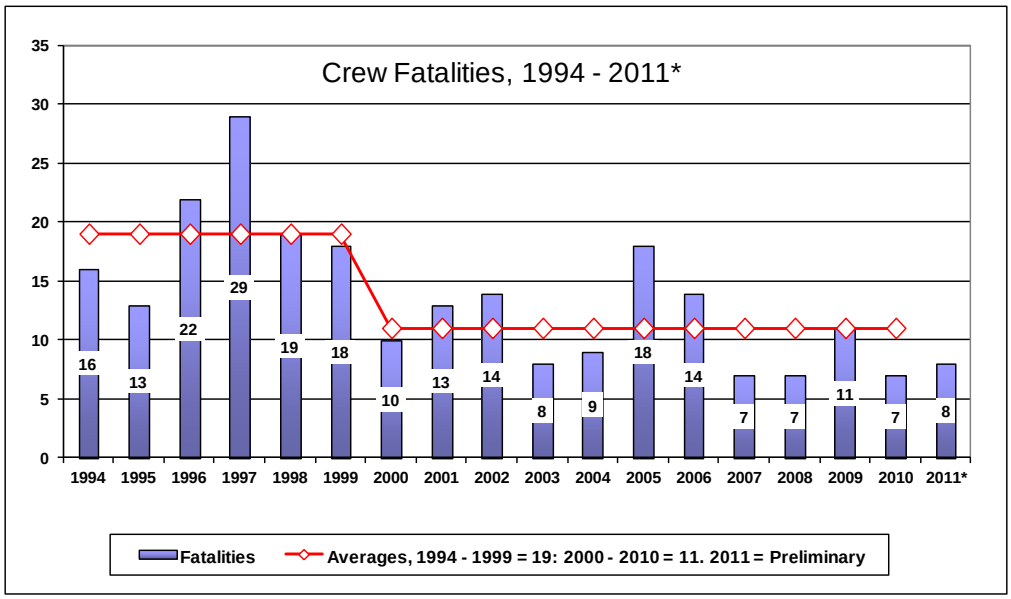
Coast Guard-AWO Safety Partnership
Quality Action Team

On
Reducing Fall-Overboard Crew Fatalities

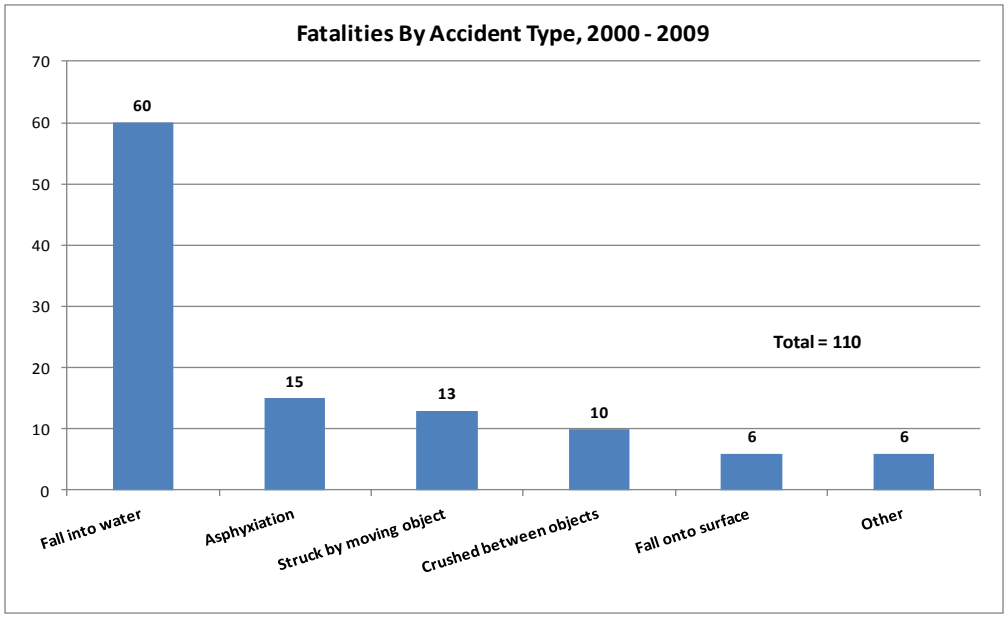
April 2012

Overview

The Quality Action Team (QAT) on Reducing Fall-Overboard Crew Fatalities was chartered on June 28, 2011, under the auspices of the Coast Guard-AWO Safety Partnership first inaugurated in September 1995. The Coast Guard-AWO Safety Partnership centers around a National Quality Steering Committee (QSC), a group of senior Coast Guard and barge and towing industry leaders whose principal function is to identify safety or environmental protection problems of national scope for cooperative Coast Guard-industry attention. The Coast Guard and AWO have worked together to address the issue of crew fatalities since 1995 (Appendix I). In 1996, the Partnership produced a report that assessed the causes of deckhand fatalities in the inland towing industry and made recommendations to prevent future fatalities. Since the year 2000 the average annual number of fatalities appears to have fallen by about half to the current low of approximately eight in 2011, as shown on the chart below. However, the Coast Guard and AWO believe there is no number of fatalities that is acceptable.



The QSC at its meeting on February 23, 2011, received a report on crew fatalities from 2000-2009 prepared by the Coast Guard's Office of Investigations and Analysis. This report revealed that two-thirds of all fatalities in this ten year period, similar to the 1995 study findings, involved deckhands, and more than half these deaths resulted from falls overboard. The chart below shows the latter distribution. Therefore, the QSC directed that a new QAT be established to make recommendations to prevent towing vessel crew fatalities resulting from falls overboard. The QSC asked that the QAT attempt to glean information from Coast Guard Incident Reports, during this period, of crewmember fatalities resulting from falls-overboard and AWO data on near-misses (i.e., falls into the water that did not result in fatalities).



Tasks

The Coast Guard-AWO QAT on Reducing Fall-Overboard Crew Fatalities conducted the following tasks:

Using Coast Guard investigative reports and information available from AWO member companies:

1) Performed a detailed review of all crewmember fatalities related to falls overboard occurring during the period 2000-2010;
2) Reviewed information available from AWO member companies on fall overboard incidents that did not result in fatalities;
3) Identified causal factors contributing to fall-overboard incidents and fatalities resulting from falls overboard;
4) Developed a list of recommended intervention strategies to address these casual factors;
5) Prepared interim reports to the QSC at its August 2011 and February 2012 meetings of its preliminary analysis of the factors leading to falls overboard; and,
6) Developed a recommended outreach plan to ensure all AWO members are aware of the Working Group's recommendations and tools available to assist them in implementing these recommendations.

Membership

Co-chaired by team leaders CDR Lee Boone, Office of Vessel Activities, Domestic Compliance Division, Coast Guard Headquarters, and Mr. James K. Smith, Chairman AWO Interregion Safety Committee, Safety and Environmental Coordinator, Magnolia Marine Transportation Company, the QAT brought together participants from the inland towing industry, U.S. Coast Guard Headquarters and the Towing Vessel National Center of Expertise (TVNCOE). The QAT conducted its work between September 2011 and March 2012. (A full list of QAT members is included in Appendix II).

Process and Findings

The QAT's first meeting was held in September 2011 and reviewed the report of the 1996 Crew Fatalities QAT and a Coast Guard prepared Review of Crew Fatalities 2000-2009. The review showed that the major factors related to crewmember deaths in the current data remain largely unchanged since 1995. While the number of fatalities has fallen by approximately 50 percent over this time period, falls overboard, predominantly of deckhands, remain the leading cause of crewmember deaths.

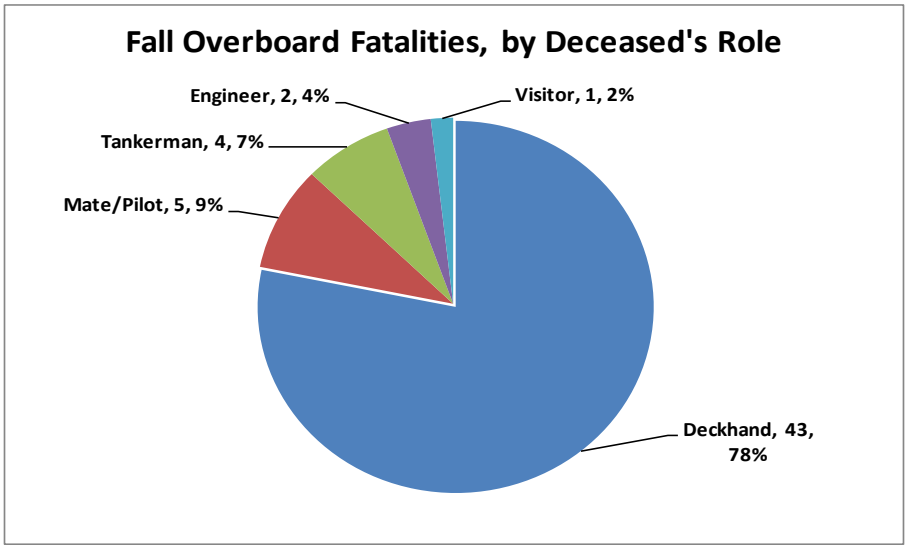
To begin its work, the QAT developed a set of criteria to evaluate the causes and possible preventative strategies of each fall overboard fatality. Members decided to study all incidents that occurred between 2000 and 2010 and, after eliminating several inapplicable incidents, the data set included 55 fall-overboard fatalities. The team developed an electronic form for use in analyzing the 55 fatalities. The electronic forms were pre-loaded with incident investigation details from the Coast Guard's MISLE (Marine Information for Safety and Law Enforcement) database, so the members could focus on the analysis of causes and preventive strategies. Also, team members had access to the individual investigation reports, minus items subject to the Privacy Act. (Items reviewed from the Incident Review form are shown in Appendix III and the lists of causal factors and possible preventive strategies, developed by the QAT members, are shown in Appendix IV).

The QAT agreed that the casualty review of the 55 cases from the 2000–2010 would be best accomplished in teams. Therefore, the QAT divided itself into four working groups. Each group included one representative from the Coast Guard and four AWO members who reviewed approximately 14 casualty reports individually, then as a group, and agreed on the major causal factors for each. During their review of the casualty reports, team members found that some details were not available, for various reasons. For example, some of the falls overboard were not observed. Thus, the event or action that caused the person to fall overboard was unknown.

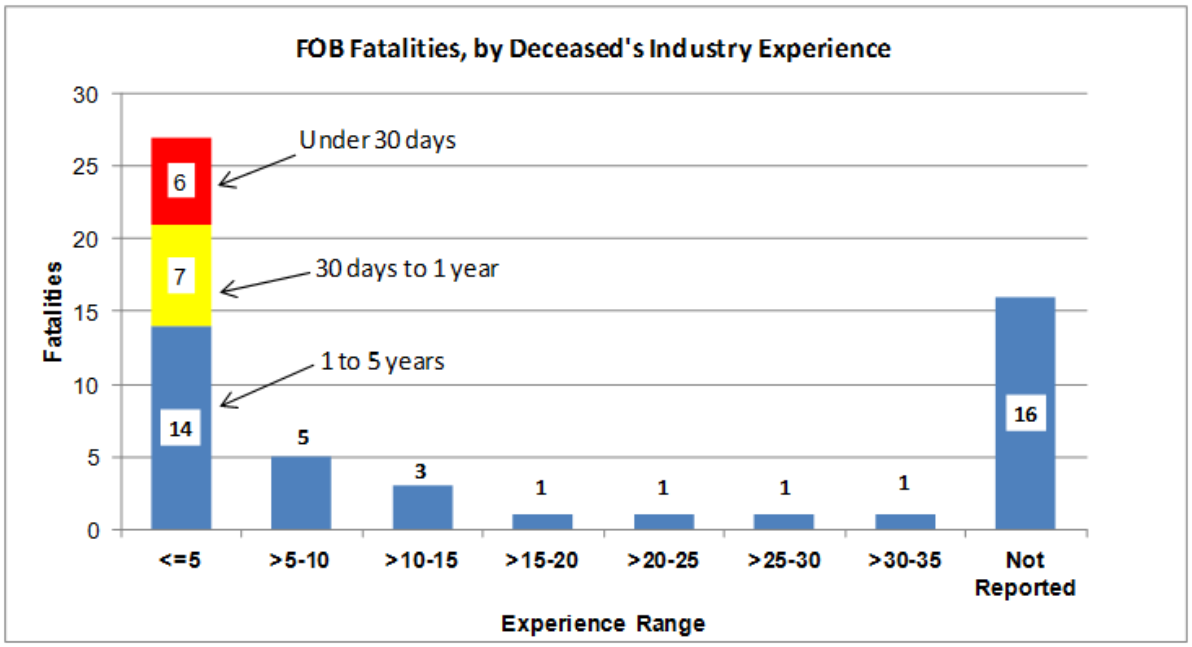
Results of the QAT's review revealed:

- One third of all fatalities occurred while the towing vessel was moored.
- Deckhands experienced 78 percent of the fatalities.
- Statistically the correlation between time and fatalities was low.
- Experience level appeared to be a significant factor. Twenty four percent of the fatalities involved persons with less than one year of experience. In fact, six fatalities involved persons with less than one month of experience.
- Two-thirds of the fatalities were not witnessed.
- PFD's were used in only 38 percent of the fatalities.
- The causal factors are distributed across several categories. Most of the primary causes were attributed to the deceased. The top two causes were illegal drug/alcohol use and loss of balance, with eight incidents each. Overall, the largest organizational factors were inadequate oversight and inadequate supervision.
- The most frequently recommended preventive actions in the initial review were training, better procedure enforcement, buddy/shadow system, and better oversight.

Demographics

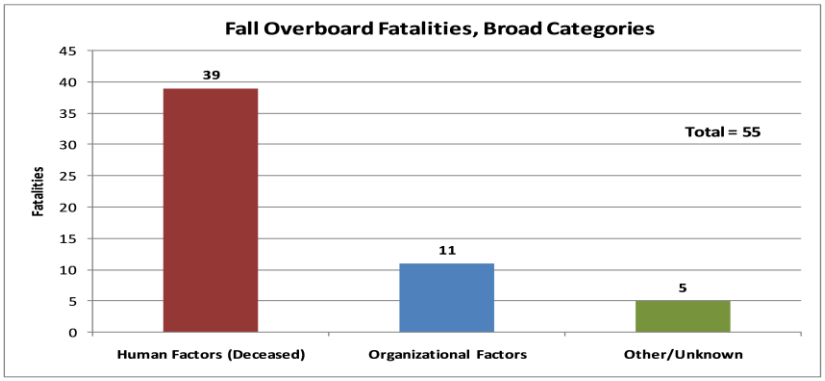


Deckhands experienced the highest fatalities at 78 percent

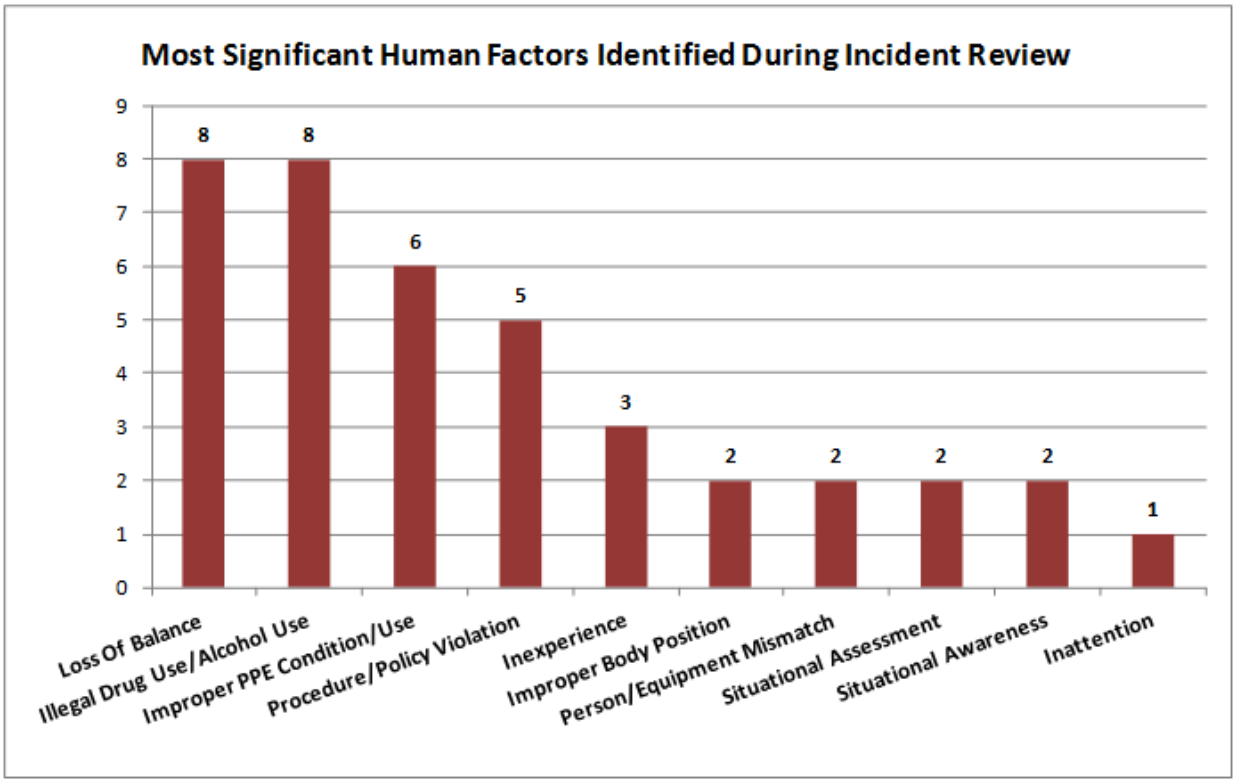


Six of the fatalities were crew members with less than one month of experience, 24 percent had less than one year of experience, and a full two-thirds of the fatalities were not witnessed.

Identification of Causes

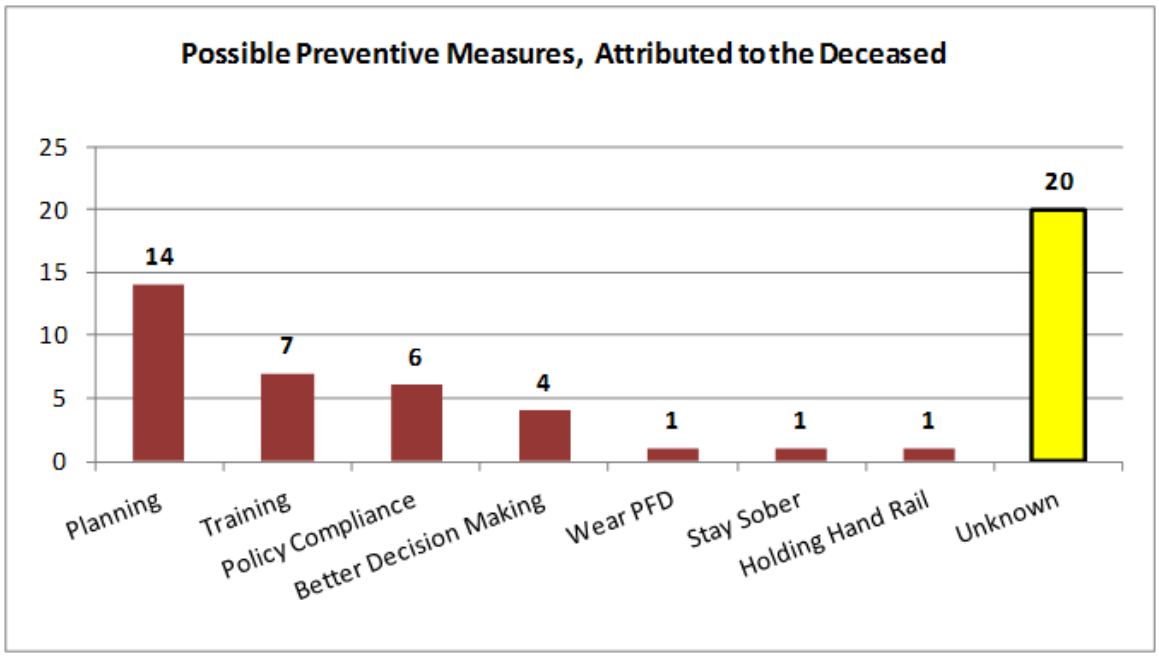


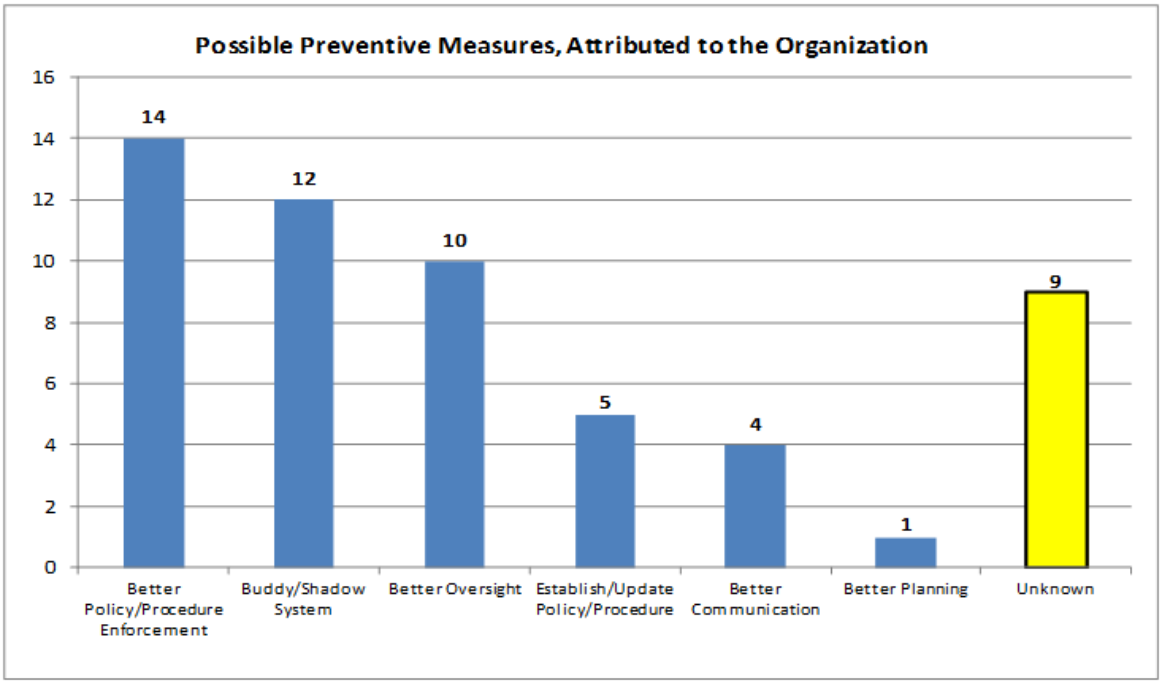
The team looked at causal factors in three broad areas: Human factors (attributed to the deceased), Organizational factors, and other (such as equipment failure or external factors).



The QAT's analysis found that more than two-thirds of the fatalities were human factors attributed to the deceased. The human factors, Loss of Balance and Drug/Alcohol use were identified as the most frequent factors. It is important to keep in mind that these factors, although unacceptably high, accounted for just eight incidents each over the ten year period.

Preventive Strategies





While a majority of the identified causes were attributed to the crew member, most of the potential preventive strategies seemed to be organizational. Further, no single factor or strategy was identified that will reduce falls overboard. Instead, the QAT team members concluded that development a *safety culture* that involves all levels of the organization would be the best approach.

AWO Member Companies Fall Overboard Incidents

In addition to the Coast Guard's investigation reports, the team reviewed data from the AWO Safety Statistics program. The AWO Safety Statistics Program is a voluntary program designed to efficiently collect and report crew injury and fall overboard statistics for participating AWO members. AWO's third-party contractor, Hile Group, manages the program, collecting and reporting safety statistics to participants in a completely confidential manner. Hile Group receives quarterly reports from participating companies and from that data produces a summary report. The summary report includes quarterly and year-to-date totals in a format that can be use to compare a company's injury rates to companies engaged in like operations and against the universe of participants as a whole. Participating companies receive reports with data from their own companies and aggregate totals based on information reported by other participants. Safety statistics are collected in four areas: crew fatalities, recordable injuries, lost time injuries, and fall overboard incidents. (A copy of the AWO Safety Statistics Fourth Quarter 2011 Report is included in Appendix V).

The table below summarizes the fall overboard reports that were received in a recent 3 year period. Overall, the data indicates that for every reported fatality, approximately 22 other persons fell overboard. Those other incidents might be considered "near misses" for fatalities. It should be noted that incident reporting to the AWO is voluntary, and the data does not identify causes. Thus, these figures represent only a sample of the occurrences in the industry. However, the team believes that it provides valuable feedback and can be a source of valuable lessons learned.

Year	Fatalities	Non-Fatalities
2008	1	62
2009	3	53
2010	3	41

The AWO Safety Statistics showed that 68% of the reported falls overboard, (fatal and non-fatal), for calendar years 2009 – 2011 involved deckhands. This is consistent with the fatality reports received by the Coast Guard. Also, the Hile Group near-miss data indicates that the use of Personal Floatation Devices can significantly improve the survivability of a fall overboard. Of the non-fatal incidents, 93% of the survivors were wearing either a PFD or a work vest.

	2009	**2010**	**2011**
Non-fatality/no PFD	2	1	2
Non-fatality/PFD	6	9	8
Non-fatality/work vest	16	9	17
Fatality/PFD	0	1	1
Fatality/no PFD*	2	0	0

* For the two fatalities where the victim was wearing a PFD:

One fell between two barges;

One was swept off a boat by a line in high wind and water.

Recommendations

The QAT developed the following recommendations based on its review of the Coast Guard Incident Reports and the local knowledge and experience of the team members.

1. Develop guidance that companies can use in developing a robust Safety Culture wherein unsafe acts are unacceptable to all employees. The QAT's analysis of the 55 fatalities revealed a preponderance of fatalities resulted from human factors such as acts or omissions by the victim, yet it was organizational factors such as training, policy enforcement and management oversight that the QAT believes are the most significant areas for improvement. No single prevention strategy is sufficient to address all of these factors and achieve the goal of preventing crew fatalities resulting from falls overboard, rather a holistic approach that stresses the establishment of a *safety culture* wherein engaging in unsafe behaviors is unacceptable to executive, line management and vessel crews alike. The QAT believes that establishment of a robust *safety culture* is the best preventative measure! Based on the experience of the airline industry, and advice from the National Transportation Safety Board (NTSB), the essential elements in establishing a *safety culture* are:
    a. A management culture where senior management demonstrates a commitment to safety and a concern for hazards that are shared by employees at all levels within the organization;
    b. An informed culture where the organization collects and analyzes "the right kind of data" to keep informed of the safety health of the organization;
    c. A reporting culture where employees are open and encouraged to report safety problems, have the assurance that the information will be acted upon, confidentiality will be maintained or the data de-identified and employees will not be punished or ridiculed for reporting;
    d. A learning culture where the organization is able to learn and change from its prior mistakes; and,
    e. A just culture where employees realize they will be treated fairly, not all errors and unsafe acts will be punished (if the error was unintentional), but those who act recklessly or take deliberate and unjustifiable risks will be punished.

   If the QSC agrees, to accomplish this recommendation, the QAT in follow on work, will reach out to AWO member companies that have been successful in developing the type of *safety culture* described above, and using that information, as well as information gained from other sources, produce a guidance document for presentation to the QSC at its February 2013 meeting that companies can use to guide them in developing their own robust *safety culture.*

2. Develop a tool box of fall-overboard lessons learned and best practices that can be incorporated into a company's safety management system policies and procedures. Many companies have implemented successful strategies to prevent falls-overboard. The QAT believes that by cataloging these prevention strategies and making them available to all towing companies through the AWO Website, awareness of risk, and strategies to prevent these types of casualties, will result in a reduction in the number of fall-overboard incidents. Production of this tool box should be led by the AWO Responsible Carrier Program Accreditation Board, working with the AWO Interregion Safety Committee and made available to member companies and the industry by February 2013.

3. Use the Safety Committees to share the experiences of companies that have developed

successful fall overboard prevention strategies. The AWO Safety Committees, which include the largest gathering of safety professionals in the tugboat, towboat and barge industry, can be used to communicate successful strategies used by companies to prevent falls overboard and act as a catalyst for discussion and increased awareness of the problem. Fall-overboard prevention strategies and lessons learned should be made a regular part of all AWO Interregion Safety Committee meetings beginning with the 2012 Summer Meeting.

4. Establish a process for the collection and dissemination of fall-overboard near-miss data. Currently the only near-miss data specifically collected on falls overboard comes from the AWO Safety Statistics program. The QAT believes that this is inadequate. Collection and communication of data is a necessary element in developing a *safety culture*. AWO should continue its work to develop a near-miss reporting system that is user-friendly, contains sufficient data to develop cause-specific prevention strategies, and is mandatory under the RCP. The QAT believes that aggregate data should be shared widely throughout the AWO membership and the industry. Effective immediately, all AWO companies reporting a fall-overboard on their quarterly safety statics report to AWO should include with that report a completed copy of the AWO Fall-Overboard Questionnaire Form (Appendix VI). Data collected will be included in the quarterly generic safety statistics report and reported in the *AWO Letter*.

5. Develop an incident investigation form that can be used by investigators (CG or company) helpful in developing corrective/preventive actions. During the review of the 55 fall-overboard casualties, it was apparent that information contained in fall-overboard incident reports often lacked sufficient information on the details of the incident to enable reviewers to determine the probable cause of the incident and develop preventative strategies to address the cause or causes. Therefore, the QAT recommends the development of an incident investigation form that can be used by both the Coast Guard and companies to guide the collection of relevant information that can be used to identify the causes and identify possible preventative strategies to prevent falls-overboard. Such a form may be useful for other types of casualties. Development of this form should be accomplished by a new QAT chartered under the NQSC.

6. AWO and Coast Guard should develop and sponsor a Protection of the Mariner Safety Award. In addition to the development of a strong *safety culture*, the QAT believes that competition and peer pressure are among the most effective strategies to encourage companies and individuals to maintain their focus and awareness of safety. Therefore the QAT recommends that the Coast Guard and AWO jointly sponsor a safety award that specifically focuses on outstanding efforts by companies in protecting their employees from injury. Details of such a program should be developed jointly by the Coast Guard and AWO to include criteria for the award, the composition of an awards committee and recommendations on the type and level of recognition of the winners. The development of this program, if approved by senior Coast Guard leadership and the AWO Board of Directors, should be developed by a new QAT chartered by the NQSC.

7. Results of this QAT, the importance of the use of Personal Floatation Devices, and future work to prevent falls-overboard should be widely shared with industry. Communication of the work of the QAT should be accomplished through the Coast Guard-AWO Safety Partnership National Quality Steering Committees (QSC) and Regional Quality Steering

Committees (RQSCs), publication of its recommendations and progress in accomplishing these recommendations through the *AWO Letter* and AWO Website, and in reports to AWO's Executive Committee and Board of Directors. The QAT also envisions that the Coast Guard Towing Vessel National Center of Expertise and the Seamen's Church act as a resource to provide information and assistance to companies in developing their own *safety culture* and fall-overboard implementation strategies.

8. Publish the results of this study in various industry publications. *Workboat, Waterways Journal* and *Professional Mariner* are among the publications that should be encouraged to publish the QAT's findings and recommendations to increase the public and industry's awareness of its safety efforts. This effort should be lead by the AWO's Public Affairs department.

APPENDIX I

SUMARY OF

FALL-OVERBOARD PREVENTION INITIATIVES

Summary of
Fall Overboard Prevention Initiatives

1996

- Fall Overboard QAT issued its report.
- A requirement for a Fall Overboard Prevention policy became the first addition to the RCP.
- Safe Decks brochure developed through Coast Guard-AWO Safety Partnership.

1999

- New QAT formed to review the 1996 QAT report on Towing Vessel Crew Fatalities recommendations and assess their implementation status.

2001

- Safety Committee developed a list of FOB prevention Best Practices.

2002

- Safety Committee developed a FOB Prevention lesson plan.
- Safety Committee developed a Slip, Trip and Fall Prevention lesson plan.

2003

- Safety Committee developed a list of inland FOB Risk Factors.
- Safety Committee developed a Working in Darkness lesson plan.
- AWO begins collecting FOB statistics.

2004

- Safety Committee developed a list of coastal FOB Risk Factors.

2005

- Safety Committee developed a Preventing Slip, Trips, and Falls – Beyond the Basics lesson plan.
- Safety Committee developed a Ladder Safety lesson plan.

2006

- Safety Committee developed FOB Prevention – Making/Breaking Tow lesson plan.
- Safety Committee conducted FOB survey.

2009

- Requirement for FOB Prevention training for all crewmembers added to the RCP.
- Requirement that companies track falls overboard added to the RCP.
- Fall Overboard Subcommittee developed a Developed FOB Questionnaire.

2011

- Fall Overboard Subcommittee developed improved FOB Observation Form.
- AWO conducted a FOB survey of top ten risk factors for FOBs.

APPENDIX II

QAT MEMBERS

Coast Guard-AWO Safety Partnership
Quality Action Team

on

Reducing Fall-Overboard Crew Fatalities

MEMBERS

Co-Chairman CDR Lee Boone, Office of Vessel Activities, USCG Headquarters
Co-Chairman Jim Smith, Magnolia Marine Transport Company

Bill Abernathy, Office of Design & Engineering Standards, USCG Headquarters.
Jason Adams, Ingram Barge Company
Dave Dickey, Office of Investigations & Analysis, USCG Headquarters
Andy Cannava, C & B Marine
Jim Fletcher, Team Services, LLC
Paul Hassler, JB Marine Service, Inc.
Glenn Hotz, Hile Group
LCDR Charlotte Keogh, USCG Towing Vessel National Center of Expertise
Mike Morris, AEP River Operation
Steve Richards, BP Shipping USA
LCDR Wade Russell, USCG Towing Vessel National Center of Expertise
Tim Sizemore, AEP River Operations
Mike Weisend, AEP River Operations

APPENDIX III

ITEMS REVIEWED BY THE QAT FROM THE MISLE DATABASE

The items listed below were included in the incident review form used by team members. Many of the items were pre-loaded from the Coast Guard's MISLE database.

MISLE Incident ID Number
Calendar Year
Activity of Deceased at Time of Casualty
Activity of Vessel at Time of Casualty
Location of Deceased at Time of Casualty
Person's Role on the Vessel
Age of Deceased
Deceased's Experience on the Vessel
Deceased's Experience in the Company
Deceased's Experience in the Industry
Deceased's Hours on Duty
Incident Time of Day
Incident Hour
Was Deceased Wearing a PFD?
Was Weather a Factor?
Weather Condition
Were Drugs a Factor?
Was Alcohol a Factor?
Was Fatigue a Factor
Was a Medical Condition a Factor?
Geographic Region of the Incident
Coast Guard District of the Incident
Incident Title
Vessel Name
Vessel's Official Number
Towing Industry Segment
Vessel's Operating Company
Was the Company an AWO Member?
Was the Incident Witnessed?
Was Deceased a Vessel Employee?
The Event or Action Leading to Fall Overboard.
Causal Factor 1
Causal Factor 2
Causal Factor 3
Causal Factor 4
Causal Factor 5
Possible Preventive Measure for the Organization
Possible Preventive Measure for Deceased

APPENDIX IV

CAUSAL FACTORS AND POSSIBLE PREVENTIVE MEASURES

Shown below are causal factors and possible preventive measures developed by the QAT members to use in evaluating each of the crew member fatalities.

Human Factors (Deceased)
Distraction
Fatigue
Illegal Drug Use/Alcohol Use
Improper Body Position
Improper PPE Condition/Use
Inattention
Inexperience
Loss of Balance
Other
Person/Equipment Mismatch
Physical limitations
Procedure/Policy Violation
Situational Assessment
Situational Awareness
Organizational Factors
Inadequate Communications
Inadequate Oversight
Inadequate Policy/Procedure
Inadequate Pre-Job Planning
Inadequate Preventive Maintenance
Inadequate Supervision
Inadequate Training
Other Factors
Equipment Failure
Inadequate Equipment Design
Inadequate Lighting
Sudden Vessel Movement
Weather
Wet surface
Unknown

Preventive Measures (Deceased)
Better Decision Making
Hold Hand Rail
Planning
Policy Compliance
Stay Sober
Training
Wear PFD
Insufficient Information/Unknown
Preventive Measures (Organization)
Better Communication
Better lighting
Better Oversight
Better Policy/Procedure Enforcement
Buddy/Shadow System
Establish/Update Policy and/or Procedure
Improved Equipment Design
Improved Maintenance
Process Audit
Unknown

APPENDIX V

AWO SAFETY STASTICS FOURTH QUARTER 2011 REPORT

Report: AWO Safety Statistics Q4 2011

(October/November/December)

			Fatalities		Recordable Injuries		Lost Time Injuries		Fall Overboards	
		Manhours	Number	Rate	Number	Rate	Number	Rate	Number	Rate
Canal	Quarter	1,306,021.00	0	0.00	6	0.92	1	0.15	1	0.15
	YTD	5,011,452.00	0	0.00	27	1.08	4	0.16	3	0.12
Coastal East	Quarter	1,719,595.00	0	0.00	15	1.74	12	1.40	3	0.35
	YTD	7,147,467.70	0	0.00	55	1.54	38	1.06	4	0.11
Coastal Harbors	Quarter	2,478,091.40	2	0.16	12	0.97	18	1.45	1	0.08
	YTD	7,284,358.75	2	0.05	82	2.25	74	2.03	2	0.05
Coastal West	Quarter	838,773.00	0	0.00	7	1.67	4	0.95	1	0.24
	YTD	4,807,164.50	0	0.00	47	1.96	20	0.83	2	0.08
Fleets	Quarter	1,671,157.50	1	0.12	14	1.68	6	0.72	4	0.48
	YTD	6,300,214.75	1	0.03	78	2.48	33	1.05	14	0.44
Inland Dry	Quarter	5,747,683.00	1	0.03	41	1.43	24	0.84	3	0.10
	YTD	22,223,057.20	1	0.01	235	2.11	127	1.14	15	0.13
Inland Liquid	Quarter	5,841,591.00	0	0.00	23	0.79	14	0.48	3	0.10
	YTD	22,066,941.00	0	0.00	119	1.08	68	0.62	21	0.19
All Participants	Quarter	19,602,911.90	4	0.04	118	1.20	79	0.81	16	0.16
	YTD	74,840,655.90	4	0.01	642	1.72	354	0.95	61	0.16

APPENDIX VI

FALL OVERBOARD QUESTIONAIIRE

FALL OVERBOARD QUESTIONNAIRE

Please answer/check the appropriate items

COMPANY ID: _____

TIME OF DAY

☐ Morning ☐ Afternoon ☐ Evening ☐ Night

LIGHT QUALITY

☐ Dawn ☐ Light ☐ Dusk ☐ Dark

WEATHER CONDITION

☐ Clear ☐ Cloudy ☐ Fog ☐ Rain
☐ Snow ☐ High Winds ☐ Severe Storm

SURFACE CONDITIONS

☐ Clear/Dry ☐ Wet ☐ Icy ☐ Debris Covered

AREA OF WORK

☐ Fleet ☐ Underway ☐ Docking ☐ Undocking
☐ Skiff ☐ Locking ☐ Facing /Un-Facing ☐ Tow Work
☐ Vessel ☐ Barge ☐ Cargo Operations ☐ Boarding/Departing

POSITION HELD

☐ Captain ☐ Pilot ☐ Engineer ☐ Deckhand
☐ Cook ☐ Tankerman ☐ Shoreside ☐ Other _____

PERSONAL PROTECTIVE EQUIPMENT WORN

☐ PFD ☐ PFD w/Light ☐ Work Vest ☐ Footwear
☐ Flashlight ☐ Other _____

FALL OVERBOARD EVENT

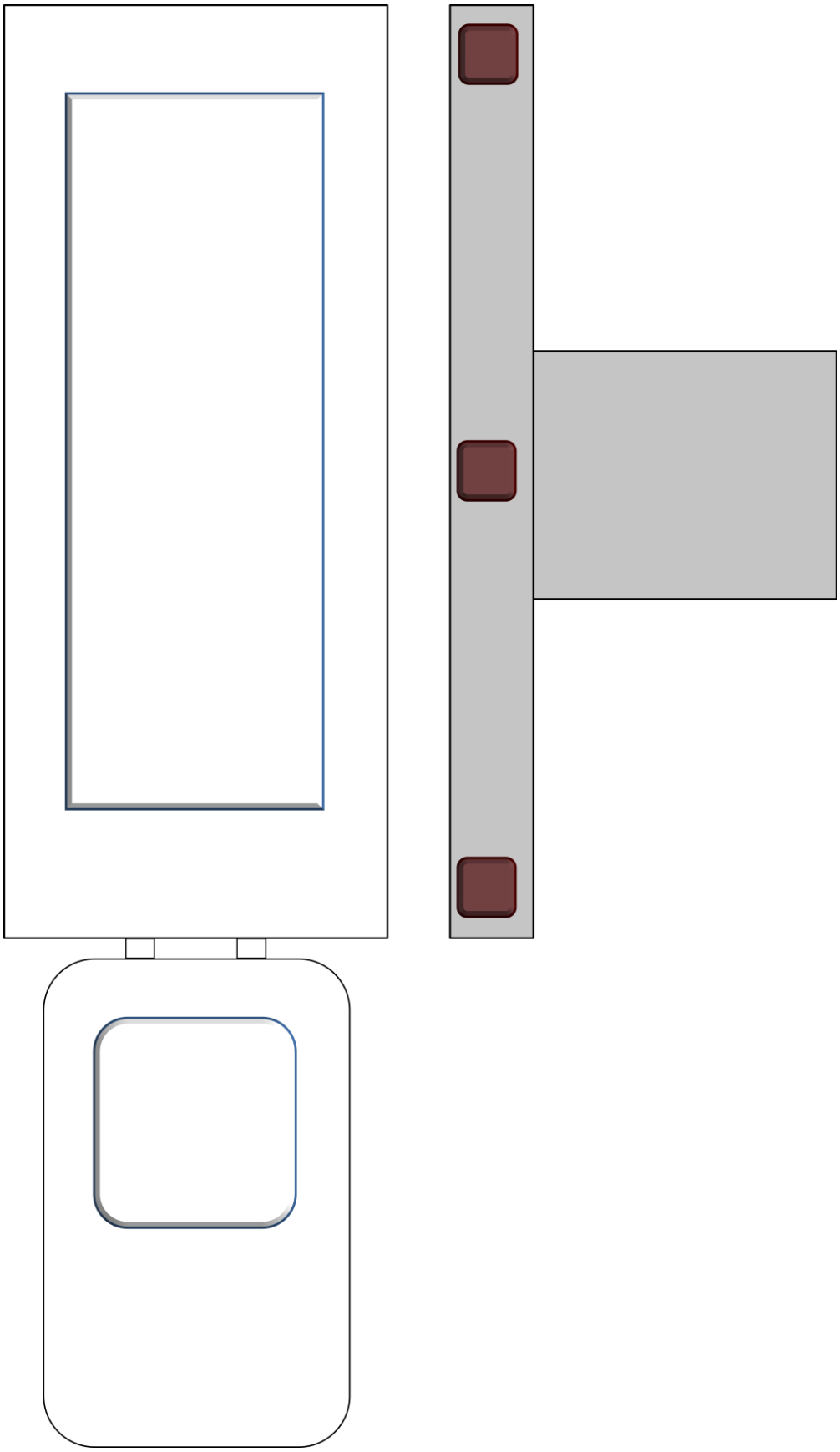
☐ Slip ☐ Trip ☐ Fall ☐ Knocked off
☐ Loss of balance from push/pull action

RESULTING INJURY

☐ Non-recordable ☐ Recordable ☐ Lost Time ☐ Fatality
☐ First Aid Only ☐ No Injury

INCIDENT DESCRIPTION:

How did the fall overboard occur?
Actual Date:_____River:_____Mile Marker:_____
Current Condition:_____
Description_____(Indicate Location From Where Fall Occurred on Reverse)



U.S. COAST GUARD

American Waterways Operators

USCG – AWO Safety Partnership

Operational Oil Spills from Towing Vessels 2001 - 2010

Prepared by:
David H. Dickey, United States Coast Guard
Matthew F.S. Baker, Moran Towing Company
Jason Adams, Ingram Barge Company

XXXXXXX 2012

TABLE OF CONTENTS

INTRODUCTION

The Coast Guard Authorization Act of 2010 required a report to Congress on the causes of oil spills for the most recent ten year period.[1] That report was delivered in April of 2012, with analyses of several marine industry segments, including towing vessels and tank barges.[2] The data showed that towing vessels had a high number of minor oil spills, when compared to other commercial vessel types. Overall, the number of incidents ranked second among commercial vessels. Further, as shown in the table below, a large majority of towing vessel spills (87%) were non-casualty or "operational" discharges, with an average of one spill every 1.4 days.

Because of the relatively high spill frequency, the USCG/AWO National Quality Steering Committee asked that operational towing vessel spills be examined in greater detail to identify the most significant factors.

Casualties and Oil Spills from Towing Vessels, By Calendar Year					
Year	All Casualties Involving Involving Towing Vessels	Casualties With Spills	Gallons Spilled	Non-Casualty Spills From Towing Vessels	Gallons Spilled
2001*	208	47	7,288	326	6,549
2002	900	16	3,120	249	15,448
2003	913	27	12,780	262	15,063
2004	832	41	22,770	263	18,959
2005	804	36	35,368	250	18,476
2006	1,121	53	42,928	281	4,472
2007	1,340	51	12,509	291	10,664
2008	1,360	50	22,870	250	5,715
2009	1,221	39	9,696	212	3,178
2010	1,552	36	22,666	182	3,476
Totals	**10,251**	**396**	**191,995**	**2,566**	**101,998**

* The 2001 Incident count is from a previous information system (MSIS), with different vessel recording criteria.

Table 1

The Data Source

The data for this study is contained in oil spill investigation reports, as recorded in two Coast Guard databases. Spills that occurred in calendar year 2001 were recorded in the Marine Safety Information System (MSIS). For calendar years 2002 – 2010, the spill reports were recorded in the MISLE database (Marine Information for Safety and Law Enforcement), which replaced MSIS.

[1] Public Law 111-281, Section 703.
[2] U.S. Coast Guard, Improvements to Reduce Human Error and Near Miss Incidents. Report to Congress, April 2012.

Methodology

Unlike marine casualty investigations, spill investigations focus only on identifying the spill source, the "responsible party" and ensuring that cleanup is performed to the extent possible. There are no requirements to document the sequence of events leading up to a spill or to identify causes. Consequently, it was necessary to examine the narrative descriptions and supporting documents in each investigation report, to get most of the details used in this study. The amount of information in the reports varied widely, from a few brief sentences to detailed statements, photographs and other documents. None of the reports mentioned fatigue, drug use or alcohol use.

Details extracted from the reports were recorded in a database that included operation of the vessel at the time of the spill, causal factors, and additional details associated with each causal factor. Causal factors were recorded in the following categories:

- Human factors
- Material conditions/failures
- Organizational factors
- External factors
- Unknown

Given the nature and content of the data source, detailed analysis beyond this level of sophistication was not practical.

Accuracy & Interpretation of Data

Some of the data items in this study were commonly reported or readily available. Those items are considered the most accurate and reliable, including:

- Vessel identifiers
- Incident date
- Operation of the vessel at the time of the spill
- Supporting details/facts, (e.g., a tank overflowed through a vent or a hose burst.)

Conversely, the identification of causal factors was dependent upon the amount of detail provided by investigators or witnesses. As each incident report was reviewed, causal factors were identified as accurately as possible, given the narrative information available. However, errors due to misinterpretation or reviewer bias are possible. For incident reports that did not provide enough detail, "Unknown" was selected.

A total of 138 incidents were removed from the initial data set, because they were not operational spills from towing vessels. In those incidents:

- the source could not be confirmed, (i.e., "Mystery" Spills).
- the source was a barge, instead of a towing vessel.
- the towing vessel belonged to a government entity.
- the vessel was derelict or out of service.
- the incident was investigated as a marine casualty and outside the scope of this study.

It is commonly known that few incidents involve just one causal factor. However, as noted, minor spill investigations do not require the collection of causal data. Consequently, this report focuses on identifying the factor(s) that are directly associated with the spill event, as opposed to preconditions and other factors. While not exhaustive, it is believed this information will be useful in understanding operational spills from towing vessels, for future prevention initiatives.

Marine Casualties

Of the 2,566 incidents in the original data set, 131 should have been investigated as marine casualties. Those incidents are outside the scope of this study and included:

- Allisions 3
- Capsizings 3
- Collision 1
- Flooding 9
- Groundings 5
- Sinkings 110

Summary Statistics

After removing the marine casualties and other inapplicable incidents described above, a total of 2,297 operational spills remained in the data set. The table below summarizes the spills by causal factor category. Most incident causes (78%) were characterized as either Human Factors or Material Condition/Failure. There was a small amount of overlap among incidents where multiple factors were identified, in addition to Human Factors.

	No. Of Incidents	% Of Total
Human Factors	993	43.2
Material Condition/Failure	801	34.9
External Cause	30	1.3
Multiple Factors	112	4.9
Organizational Factors	17	0.7
Unknown	344	15.0
Total	2,297	100.0

Table 2

On the pages that follow, this broad based information will be examined in greater detail, in order to identify the most significant factors in non-casualty spills.

CAUSES OF OPERATIONAL SPILLS

Overview

The table below summarizes operational/non-casualty spills by the operation in progress at the time of the incident. Most of the oil (63.8%) was discharged while towing vessels were either receiving oil or transferring oil internally. Given the number of "Not Reported/Unknown" incidents, it is likely this percentage is somewhat higher. Additional details about spills while receiving and transferring oil are provided next.

Non-Casualty UTV Spills, by Operation					
Operation	**Incidents**	**% of Incidents**	**Gallons Spilled**	**Gals Per Incident**	**% of Volume**
Receiving or Transferring Oil	974	42.4	27,070.1	27.8	63.8
Not Reported or Unknown	419	18.2	6,548.7	15.6	15.4
Bilge Pumping	285	12.4	2,697.8	9.5	6.4
Moored	166	7.2	2,334.6	14.1	5.5
Underway	273	11.9	2,275.2	8.3	5.4
Receiving Potable Water	20	0.9	676.5	33.8	1.6
Ballast Pumping	36	1.6	381.5	10.6	0.9
Performing Maintenance	99	4.3	355.5	3.6	0.8
Other	25	1.1	67.7	2.7	0.2
Totals	**2,297**	**100.0**	**42,407.6**	**18.5**	**100.00**

Table 3

Receiving or Transferring Oil

Table 4 summarizes the types of causal factors identified while towing vessels were receiving oil or transferring oil internally. Human factors accounted for 75% of the incidents and 88% of the volume. Also, the average spill size for incidents involving human factors was more than double that of other spills.

Receiving and Transfer Spills By Causal Factor Type					
Factor Type	**Incidents**	**% Of Incidents**	**Gallons Spilled**	**% Of Volume**	**Gallons Per Incident**
Human Factors*	731	75.1	23,864.1	88.2	32.6
Material Condition/Failure	129	13.2	1,679.2	6.2	13.0
External Cause	11	1.1	78.8	0.3	7.2
Unknown	103	10.6	1,448.0	5.3	14.1
Totals	**974**	**100.0**	**27,070.1**	**100.0**	**27.8**

* Multiple factors were identified in 47 of these incidents.

Table 4

When shown separately, spill volumes during internal transfers, account for more than half of the reception/transfer volume, but only 35% of the incidents. Further, of the 2,297 incidents in this study, internal transfer spills are more than one third of the total spill volume. When compared to receiving fuel or oil, the average spill size was about 2.6 times larger. These results may be unexpected, given that internal transfers generally involve smaller volumes. Thus, additional emphasis on internal transfers may be appropriate in future prevention initiatives.

Additional details on the causal factors related to receiving and internal transfer of oil are presented next.

Receiving and Transfer Spills					
Operation	**Incidents**	**% Of Spills**	**Gallons Spilled**	**% Of Volume**	**Gallons Per Incident**
Internal Transfer	337	34.6	15,725.6	58.1	46.7
Receiving Fuel/Oil	637	65.4	11,344.5	41.9	17.8
Totals/Average	**974**	**100.0**	**27,070.1**	**100.0**	**27.8**

Table 5

Human Factors

The types of human factors associated with receiving and internal transfer of oil are shown in Figure 1. The biggest factor was inattention, with 43% of the incidents. Procedural errors (27%) included the performance of tasks in the wrong order or skipping steps in a procedure, such as disconnecting a hose before ensuring that all valves were closed. Mistiming errors (27%) included underestimating how quickly a tank would fill or not allowing enough time for oil flow to stop.

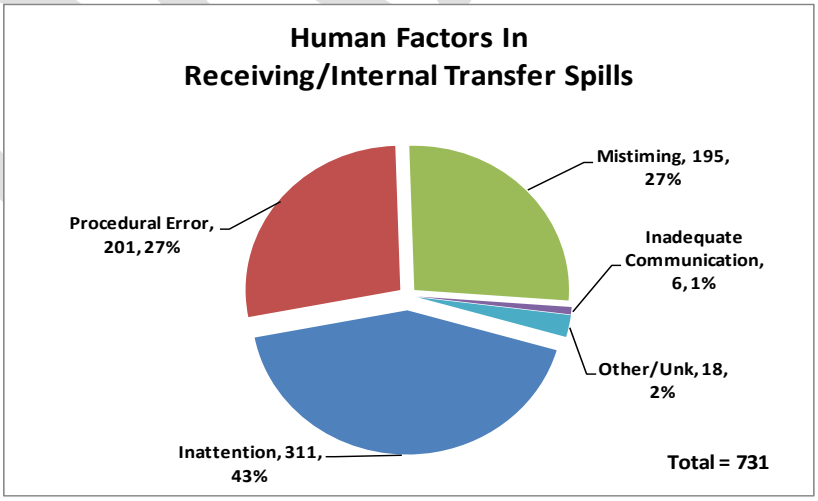


Figure 1

In Table 6, human factors are compared to the spill path/source. Most spills (87%) involved some form of tank overflow, as shown on the first three rows. The term 'Tank burp" is used to indicate a tank overflow of short duration, usually driven by trapped air or a high fill rate. Given this combination of factors and the high percentage of spills, it may be appropriate to focus on the policies, procedures and training related to receiving and transferring oil.

Human Factors in Receiving Oil and Internal Transfer Spills						
Spill Path/Source	**Inattention**	**Procedural Error**	**Mistiming**	**Communication**	**Other/Unk**	**Totals**
Tank overflow	235	66	117	4	10	**432**
Tank overflow: Incorrect valve alignment	40	73	3	1	4	**121**
Tank 'burp'	1	5	75		1	**82**
Hose came out of tank.	8	11			1	**20**
Valve not fully closed	14	5				**19**
Transfer hose not capped	2	15			1	**18**
Sight glass valve closed	3	9				**12**
Put hose in wrong tank	1	5				**6**
Connected to wrong pipe	2	3				**5**
Tank cover left open	1	2				**3**
Overpressurized transfer hose		2				**2**
Other	4	5		1	1	**11**
Totals	**311**	**201**	**195**	**6**	**18**	**731**

Table 6

Material Failures

As noted above, about 13% of the reception/transfer spills were caused by material failure. Nearly two-thirds of this group involved components of the fuel oil system. The most frequent component failures were valves (24), piping (14), and hoses (10). The hull failures were detected as tanks were filled and fuel appeared in water next to a vessel. The remaining incidents were evenly distributed among a variety of components in the bilge, ballast and waste water systems. Eight of those discharges occurred from wasted pipes that ran through fuel tanks.

Material Failures While Receiving or Transferring Oil					
System	**Spills**	**% Of Spills**	**Gallons Spilled**	**% Of Volume**	**Gallons Per Incident**
Fuel Oil System	82	63.6	937.6	55.8	11.4
Hull	27	20.9	581.0	34.6	21.5
Other	20	15.5	160.6	9.6	8.0
Total	**129**	**100.0**	**1,679.20**	**100.0**	**13.0**

Table 7

External Causes

Of the 11 spills attributed to external causes, 8 resulted from the wakes of passing vessels and 2 resulted from vessel movements during severe weather. *{Does this mean the tanks were too full?}* In the remaining incident, a shipyard worker sealed a tank vent, causing an overflow elsewhere in the system.

Unknown Causes

Of the 974 reception/transfer spills, there were 103 with no causal details. However, most reports included details about the path or source of the spills. Nearly all were tank overflows. Based on the above distribution of causes (i.e., 75% of reception/transfer spills), approximately 77 of those incidents would likely be attributed to human factors.

Oil Reception and Transfer Spills With Unknown Cause

Spill Path/Source	Spills	Gallons Spilled
Tank overflow	93	1401.4
Unknown	9	45.6
Vessel Movement	1	1
Totals	**103**	**1448**

Table 8

No Reported Operation

Of the 2,297 incidents in this study, 419 (18%) included no description of events or conditions prior to the spill. However, about two-thirds this group contained some useful causal information.

Unlike the oil reception and transfer incidents, human factors were only 11% of these incidents. However, the average spill size was significantly larger than spills by other causes.

Spills When The Vessel Operation Is Not Reported Or Unknown					
Factor Type	Incidents	% Of Incidents	Gallons Spilled	% Of Volume	Gallons Per Incident
Human Factors	46	11.0	1,734.8	26.5	37.7
Material Condition/Failure	230	54.9	2,092.6	32.0	9.1
External Cause	3	0.7	35.1	0.5	11.7
Unknown	140	33.4	2,686.2	41.0	19.2
Totals	**419**	**100.0**	**6,548.7**	**100.0**	**15.6**

Table 9

Human Factors

For this sub-set of spills inattention was identified in 34 incidents and procedural error was identified in 8 others. The spill paths/sources shown in Table 10 suggest that most of the volume (89%) was discharged while receiving or transferring oil. One incident attributed to "incorrect valve alignment" was 1,000 gallons in size, (58% of the volume).

Human Factors In Spills When Operation Is Unknown			
Spill Path/Source	**Incidents**	**Gallons Spilled**	**% Of Vol.**
Incorrect Valve Alignment	9	1,418.3	81.76
Tank cover left open	3	111.0	6.40
Bumped Valve Open - Accidental	1	100.0	5.76
Bilge pump activated, unintended	3	52.0	3.00
Vessel Movement	1	20.0	1.15
Small Container overturned	14	12.4	0.71
Tank overflow	1	10.0	0.58
Deck Runoff	6	6.0	0.35
Other	8	5.1	0.29
Totals:	**46**	**1,734.8**	**100.00**

Table 10

Material Failures

Material failures represent the largest sub-set of incidents (55%) in this group, and the largest total volume, (2,092.6 gallons or 32%). The location and type of failures, shown in Table 11, suggests that many of them developed over time or in inaccessible locations. In 22 incidents, wasted or damaged piping passing through fuel tanks allowed oil to escape overboard. Of that number, 14 were part of marine sanitation/sewage systems, discharging a total of 844 gallons.

The hull failures occurred in plating adjacent to spaces containing oil. Of the steering, shafting and propeller failures, there were 35 hydraulic steering hose failures. Most of those spills were 1 gallon or less.
{*Possible items for preventive maintenance, survey, inspection?}*

Material Factors In Spills When Operation Is Unknown			
System	**Incidents**	**Gallons Spilled**	**% Of Volume**
Piping Through Fuel Tanks	22	904.1	43.2
Hull	67	662.1	31.6
Steering, Shafting & Propeller Components	65	203.5	9.7
Fuel & Lube Oil System Components	36	199.1	9.5
Mooring & Towing Equipment	19	31.0	1.5
Other	21	92.8	4.4
Totals	**230**	**2092.6**	**100.0**

Table 11

Underway or Moored

Overall, 439 spills (19.1%) occurred while the vessel was either underway or moored, with 4,610 gallons discharged, (10.9%). As shown in Table 12, material failures were the primary factors in most of the underway/moored incidents (72.7%) and more than half of the volume (56%).

Spills While Underway Or Moored					
Factor Type	**Incidents**	**% Of Incidents**	**Gallons Spilled**	**% Of Volume**	**Gallons Per Incident**
Human Factors	87	19.8	1,326.5	28.8	15.2
Material Condition/Failure	319	72.7	2,583.5	56.0	8.1
External Cause	13	3.0	300.5	6.5	23.1
Unknown	20	4.6	399.3	8.7	20.0
Totals	**439**	**100.0**	**4,609.8**	**100.0**	**10.5**

Table 12

Human Factors

Nearly all of the spill volume attributed to human factors (84%) resulted from incorrect valve alignment, (Table 13). More than half of those incidents (18) were caused by closed or incorrectly aligned fuel return valves from engines, including one incident of 501 gallons. Seven others occurred while discharging waste oil.

Of the 14 tank overflows, 8 occurred while discharging waste oil. Also, all of the discharges when a hose came out of a tank or a transfer hose was not capped occurred while discharging waste oil.

Human Factors: Spills While Underway or Moored						
Spill Path/Source	Totals	Inattention	Procedural Error	Mistiming	Other	Gallons Spilled
Incorrect Valve Alignment	34	15	18		1	1,112.6
Tank overflow	14	5	5	4		50.0
Small Container overturned	12	8	3		1	21.5
Hose came out of tank.	7	3	4			68.7
Transfer hose not capped	5	2	3			19.0
Vessel Movement	5	3	2			29.0
Deck Runoff	3	2	1			1.2
Tank cover left open	2	2				10.3
Willful violation	2				2	0.2
Accumulated Oil in Bilge	1	1				8.0
Accumulated Oil in Containment	1	1				1.0
Backflow through crankcase vent	1		1			5.0
Totals	**87**	**42**	**37**	**4**	**4**	**1,326.5**

Table 13

Material Failures

As noted, most spills while underway or moored (72.7%) were preceded a material failure. As shown in Table 14, about half of the spill volume from this group involved failures of hull plating, including one spill of 694 gallons.

Hydraulic steering hose failures were the most frequent component failure in this group, with the second largest spill volumes.

Material Failures: Spills While Underway or Moored			
System	Incidents	Gallons Spilled	% Of Volume
Hull Plating	63	1,323.3	51.2
Steering System - Hydraulic Hose	89	484.5	18.8
Fuel & Lube Oil System Components	40	227.5	8.8
Other Steering, Shafting, Propeller Components	57	196.8	7.6
Waste Oil Storage/Transfer Components	12	94.4	3.7
Mooring & Towing Equipment	21	47.7	1.8
Piping Through Fuel Tanks	14	44.7	1.7
Other	23	164.6	6.4
Totals	**319**	**2,583.5**	**100.0**

Table 14

External Factors

The 13 incidents caused by external factors included: damage by waterway hazards (5), wake damage (5), severe weather (2), and heeling induced by a towed barge (1). One incident spilled most of the oil, 200 gallons, after wake damage caused a vessel to sink.

Other Spills

The remaining spills in the data set accounted for less than 10% of the spill volume, but were thinly divided among various operational conditions or situations. Those incidents are summarized below.

Bilge Pumping

Overall, bilge pumping incidents represented 12.4% of the spills, but only 6.3% of the volume. There were 6 incidents of approximately 100 gallons. The average spill size was 9.5 gallons. These spills were distributed among a number of causes, with no notable pattern. Approximately 20% of the reports contained no causal information. All but 8 spills appeared to be accidental. Some incidents occurred when pumps activated automatically. Situations leading to accidental discharge include:

- Contamination of "clean wells".
- Oil leaks or flooding through propeller shaft or rudder seals.
- Incorrect valve alignment when pumping from other spaces.
- Accidental pump activation while performing other duties.
- Material failures, including broken oil hoses, piping, valves, and leaking tanks.
- Failure to check bilge contents before pumping.

Ballast Pumping

There were 36 spills reported from ballast pumping operations, with an average spill size of 10.6 gallons. Of those incidents, 21 involved contaminated ballast water. Six incidents were caused by incorrect valve alignment.

Receiving Potable Water

Twenty (20) oil spills occurred while towing vessels were receiving potable water, including one spill of 180 gallons and another of 350 gallons. Nearly all (18) were caused by water hoses that were connected to oil tanks, or vice-versa. While small in number, these incidents are notable, because they appear to be easily prevented by improved markings.

Performing Maintenance

There were 99 spills during maintenance operations, with an average spill size of 3.6 gallons. The data showed no notable patterns, with one exception: Hull plating failures discharged oil 28 times as vessels were lifted out of water for dry-docking.

CONCLUSIONS

This report shows that operational spills from towing vessels occur for a variety of reasons. Thus, no single measure will prevent all spills. However, it may be possible to reduce or prevent the most serious spills by focusing on the types of incidents responsible for the most volume. The most significant findings are summarized as follows:

Receiving or Transferring Oil – Nearly two-thirds of the total spill volume was discharged while towing vessels were either receiving oil or transferring oil internally. Of those incidents, most (75%) appear to be the result of human error. The most frequent error types were inattention, procedural, and mistiming errors. Also, within this group of incidents, the average spill size from internal transfers was more than double the amount spilled when receiving oil. Many of these incidents can be prevented with additional emphasis on training, policy, or procedure, which should be included in each vessel's safety management system and subject to periodic audits.

Material Failures – When no oil transfer was in progress, material failures were most frequent cause of spills. The most frequent failures included:

- 185 spills from wasted or fractured hull plating adjacent to oil tanks – the subject of a recent working group study.
- 156 spills from component failures in fuel and lube oil systems.
- 124 spills from leaking or ruptured hydraulic steering hoses.
- 44 spills from wasted or damaged pipes that passed through oil tanks.

It is recommended that emphasis on the above items be included in vessel preventive maintenance procedures, inspections, and SMS audits.

Other Factors – In addition to the above findings, two small clusters of incidents were identified. While not large in numbers or volume, it is likely those spills can be easily prevented.

- In addition to spills while receiving or transferring oil, incorrect valve alignment was identified as a human factor under other conditions. This included 18 incidents where return flow from running machinery was routed to a tank which overflowed. One such incident discharged over 500 gallons. Incorrect valve alignment was also noted during ballast pumping and discharging of waste oil.
- Twenty spills occurred when a potable water hose was inserted in an oil tank, or vice versa. While infrequent, there were two relatively large spills of 350 and 180 gallons. It is likely these spills can be prevented with improved markings.

SAFETY DOCUMENTS

Future of AWO Safety Leadership Task Force

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March 4, 2011

MEMORANDUM

TO: Board of Directors

FROM: Peter Stephaich, Campbell Transportation Company
Dale Sause, Sause Bros.

RE: Report of the Task Force on the Future of AWO Safety Leadership

Background

AWO's strategic plan, *AWO 21*, reaffirms AWO's commitment to safety leadership and raises the priority of AWO's safety mission. Goal 2 of *AWO 21* calls on the association to "lead and support AWO members in continuously improving safety, security and environmental stewardship." Objective 2.1 of the plan directs the association to "Ensure AWO members continue to lead the marine transportation industry in safety and environmental stewardship."

At the AWO Spring Convention in April 2010, the Board of Directors established a member Task Force on the Future of AWO Safety Leadership to develop a vision of what safety leadership should mean for AWO and AWO members in 2010 and beyond, and make recommendations on an AWO work program to implement that vision.

We were asked by the Executive Committee to co-chair the Task Force. Other members of the Task Force include:

- Matthew Baker, Moran Towing Corporation
- John Douglass, Crowley Maritime Corporation
- Jim Guidry, Kirby Inland Marine, LP
- Cathy Hammond, Inland Marine Service
- Susan Hayman, Foss Maritime Company
- Dan Jaworski, American Commercial Lines, Inc.
- Lee Nelson, Upper River Services
- Frederik Nyhuis, Marathon Oil Company
- Jeffrey Parker, Allied Transportation Company
- John Patterson, Ingram Barge Company
- Jeff Slesinger, Western Towboat Company
- James Smith, Magnolia Marine Transport Company
- Michael Somales, CONSOL Energy Sales Company
- Paul Tobin, AEP River Operations
- Bill Waterman, Penn Maritime, Inc.

The Task Force has held two in-person meetings (on September 21-22, 2010 and January 19-20, 2011), two conference calls, and conducted interim work via email.

Vision

Drawing on input from Task Force members and outside safety experts, the Task Force developed the following vision of AWO safety leadership:

> AWO members, by creating strong safety cultures, will lead the industry in safety and environmental stewardship by: 1) exceeding regulatory minimums, 2) striving for continuous improvement, and 3) measuring performance.

In support of this vision, the Task Force recommends replacing the current requirement for the Responsible Carrier Program (RCP) as a condition of AWO membership with the following three-part requirement for AWO carrier members:

- **Audited compliance with either the RCP or International Safety Management (ISM) Code**, with the goal of eliminating the duplicative audits to which many members of AWO are now subject;
- **Use of a continuous improvement process/self-assessment tool**, recognizing that safety is a journey, not a destination, and encouraging a self-paced process of continuous improvement; and,
- **Collection and reporting of safety statistics**, with the rationale that we cannot improve what we do not measure.

While the Task Force is proposing that these three requirements eventually become conditions of AWO membership, we are not recommending that it happens immediately. As discussed below, we believe additional work is needed to flesh out the proposed requirements and to allow for thorough discussion among the membership. If the Board concludes that these recommendations are directionally correct, further work will be needed to lay out a plan and schedule for their implementation.

In this regard, we emphasize that the goal of the Task Force is to make recommendations that add value and genuinely raise the bar of safety in our industry, not to create new bureaucracy or administrative hurdles for AWO members. We hope to challenge individual AWO members, and AWO as an organization, to take safety to the next level. Clearly, this will involve some real work. However, we have also tried to identify ways to reduce administrative burdens and create practical alternatives in the process of accomplishing that work. We elaborate on these recommendations below.

Safety Management System Compliance

The Task Force recommends that:

- To eliminate the duplication that many AWO members currently face, permit members to comply with either the RCP or the ISM Code;

- The RCP be converted into a "pure" safety management system, removing the equipment standards section since equipment requirements will be covered by Subchapter M;
- The RCP be amended as needed to ensure its acceptance by the Coast Guard as a SMS under Subchapter M; and,
- In accord with previous Board guidance, once Subchapter M is implemented, AWO should not have any role in the accreditation of auditors. RCP audits should be conducted by Coast Guard-approved third party organizations that have received training in the RCP. (Post Subchapter-M, AWO should assess what additional steps may be needed to guarantee the availability of a sufficient number of qualified auditors.)

Continuous Improvement Program

The Task Force defines a continuous improvement program as:

> The adoption of a phased implementation plan to assess safety and environmental management systems against key performance indicators. The continuous improvement cycle consists of a continuous feedback loop of planning, acting, measuring and improving. Performance is optimized through gap identification to provide company focus for planning, gap closure and future improvements.

The Task Force proposes to:

- Add a requirement to the RCP that companies implement a process for continuous improvement through use of a self-assessment process; and,
- Establish a follow-on working group to develop a Towing Vessel Self Assessment (TVSA) tool that AWO members can use to measure internal company progress and encourage striving for higher levels of performance. We propose to use as a model for the TVSA the Tanker Management and Self-Assessment (TMSA²) tool that AWO members in the liquid cargo business are familiar with, but to tailor it to tugboat, towboat and barge operations. To avoid duplication, we propose that AWO members have the option of using TVSA, TMSA² or another appropriate equivalent as a self-assessment tool.

The Task Force does not recommend that members be required to achieve a certain level of performance using the TVSA; instead, the implementation of a continuous improvement program would be the goal.

Performance Measurement

The Task Force recommends requiring all carrier members to collect and report safety statistics on a quarterly basis. The collection of safety statistics is already an RCP requirement and many members currently report statistics under the AWO Voluntary Safety Statistics program. The Task Force considers the collection and reporting of safety statics to be an important component of the continuous improvement cycle. In addition, the Task Force expects that tracking of safety statistics will be a requirement under Subchapter M.

The Task Force discussed the concerns expressed by some AWO members in the past regarding the confidentiality and complexity of safety statistics reporting. In order to address these concerns, the Task Force recommends:

- Anonymous reporting to a third party (such as the Hile Group, which currently manages the Voluntary Safety Statistics program). AWO would receive only aggregate data and a list of reporting companies, not individual company data;
- Developing processes to make reporting easier, such as Web-based reporting; and,
- Reducing the number of categories in which statistics are collected to three (coastal/coastal harbor, inland, and inland fleeting).

The Task Force proposes to capture the same statistics many AWO members voluntarily submit now – fatalities, falls overboard, recordable and lost-time injuries, and man-hours – plus the number and volume of spills into the water from towing vessels and barges. The reporting of safety statistics would enable AWO members to measure their collective safety performance and compare performance to the industry as a whole.

Near Miss Reporting and Lessons Learned

The Task Force recommends developing a process for near-miss reporting and the sharing of lessons learned as tools to assist the industry in continuous improvement. The Task Force proposes to address this issue on three levels: the company level, the AWO level, and the industry level.

- Company level: The Task Force proposes to amend the RCP to require an internal process for collecting and sharing near-miss data and lessons learned from incidents and near-misses.
- AWO level: The Task Force proposes to ask the AWO Technology Steering Group and Interregion and Coastal Safety committees to form a working group to develop a user-friendly Web-based process that AWO members could use to share and review lessons learned submitted by other members.
- Industry level: The Task Force recommends that AWO express support for the creation of an industry-wide near-miss reporting system similar to the model used by the aviation or railroad industries (with appropriate immunity and safeguards for reporters).

Environmental Stewardship

Finally, the Task Force believes it is important to give separate, focused treatment to the question of what it means to be a leader in environmental stewardship. Clearly, environmental stewardship today means more than simply not spilling oil. To address this area effectively, the Task Force proposes to establish a follow-on working group of knowledgeable members to develop a vision of environmental leadership, similar to what has been done to address AWO's safety leadership, and make recommendations on how to achieve that vision.

April Board Discussion

The Task Force will seek Board approval of these recommendations at the Spring Convention. In order to allow time for in-depth member discussion of the recommendations before the Board is asked to vote on them, the Task Force report will be the subject of the Strategic Dialogue session at the April 8 Board meeting. Prior to the Board meeting, the Task Force will develop a "Frequently Asked Questions" document for distribution to members, based on questions

received at the annual meetings of the AWO regions. The Task Force will also be prepared to brief the Board on a rough proposed schedule for the follow-on work envisioned by our recommendations.

If the Task Force recommendations are approved by the Board, we propose that the Task Force remain in existence to oversee the following subsequent work processes:

- Work by the RCP Accreditation Board to propose needed revisions to the RCP;
- Work by a subgroup to develop the proposed Towing Vessel Self Assessment tool;
- Work by a subgroup of the Technology Steering Group and the AWO safety committees to develop a voluntary mechanism for sharing lessons learned within AWO; and,
- Work by a separate working group of knowledgeable members to flesh out a vision of environmental leadership for member companies.

Conclusion

The Task Force recognizes that implementing these recommendations will involve significant work, for members and staff, and it will be necessary to keep the process moving forward without overwhelming individual members or AWO as an organization. The Task Force will need guidance from the Board on how to sequence and manage these processes, taking into account resources and other organizational objectives. Our goal is to keep pushing the envelope of what it means to be safety leaders, and to do that in a smart way that challenges but does not overwhelm AWO as an organization or individual AWO members.

Goal #2: Lead and support AWO members in continuously improving safety, security and environmental stewardship (03/29/12)			2011	2012				2013			
Objectives	**Tactics**	**Notes**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**	**Q1**	**Q2**	**Q3**	**Q4**
2.1 Implement the recommendations of the Task Force on the Future of AWO Safety Leadership.	Develop a more user-friendly safety statistics reporting program.	Working Group Formed		Begin work							
	Make safety statistics reporting a condition of AWO membership.	Upon completion of Working Group's recommendation						Tentative			
	Develop a Towing Vessel Self Assessment tool that assists members in continuously improving safety and environmental performance.	Working Group Formed				Begin work					
	Make a continuous improvement process a condition of AWO membership.	Upon completion of Working Group's recommendation								Tentative	
	Develop recommendations for near-miss reporting/sharing of lessons learned by AWO members.	Member Working Group to be formed late 2012 or 2013						Begin work			
	Develop a vision of environmental stewardship and a work plan to achieve it.	Member Working Group to be formed late 2013 or 2014									Begin work
2.2 Enhance the value of the RCP to AWO members and secure acceptance of the RCP as a TSMS.	Review RCP and identify changes needed to ensure RCP acceptance as a TSMS.	Accreditation Board-led Working Group to be formed Q1 2012		Begin work							
	With the Coast Guard, identify steps needed to secure acceptance of the RCP as a TSMS.	Q1 2012		Begin work							
2.3 Facilitate a successful industry transition to Subchapter M.	Accreditation Board-led review of the supply of potential third-party auditors and surveyors capable of securing Coast Guard approval under Subchapter M, and recommendations on steps needed to ensure a sufficient pool of well-qualified Coast Guard-approved third-party auditors.			Begin work							
	Discuss with the Coast Guard steps needed to ensure a sufficient pool of approved third-party auditors.	Q1 2012		Begin work							
	Educate members on where improvements may be needed to prepare for compliance with Subchapter M.	Q3 2012				Begin work					
	Manage the BAIT process and resolve difficulties encountered during the TVBP.	Ongoing									

Objectives	Tactics	Notes	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
2.4 Manage the Safety Partnership to facilitate cooperation to improve safety, security and environmental stewardship.	Ensure robust participation at all meetings of the QSC and RQSCs.	Onging									
	Ensure that National and Regional QSC agendas are focused on timely and important safety issues.	Onging									
	With the CG, track trends in industry safety performance and identify areas in which action is necessary to produce improvements.	Onging									
2.5 Promote a practical, science-based approach to crew alertness, work and rest issues.	Manage Phase IV of the NU sleep study to produce useful data and analysis to facilitate indusry efforts to prevent and mitigate crew fatigue.		Underway								
	Convene the External Advisory Board and experts from the CG & NTSB to review study results and recommend next steps.	Upon completion of Phase IV study projected for Q2 2012			Tentative						
2.6 Manage the AWO safety committees to ensure a high level of value to AWO members.	Ensure Safety Committee agendas contribute to the work contained in this goal; inform attendees of the overall work of AWO, seek their input; and, present topics of interest to AWO's safety professionals.	Ongoing									
2.7 Ensure safety is fully integrated into the fabric of AWO's work.	Include safety as a part of all National and Regional AWO meeting agendas.	Ongoing									
	Ensure participation by AWO senior staff and Executive Committee members at all safety committee meetings.	Ongoing									
	Regularly invite AWO safety committee chairmen to meetings of the Coast Guard-AWO Safety Partnership, Executive Committee and Board meetings.	Ongoing									
2.8 Manage and modernize vessel security plans.	Maintain a dialogue with the Security Working Group and CG to identify any changes needed to the AWO ASP and IVSP.	Ongoing									

Charter
Working Group

on

AWO Safety Statistics Reporting

June xx, 2012

Background

The Future of AWO Safety Leadership Task Force (FOSL) was established by the AWO Board of Directors in 2010 and tasked with developing recommendations on how best to accomplish Goal 2 of AWO 21, specifically to "Lead and support AWO members in continuously improving safety, security and environmental stewardship"

Believing that an essential element in accomplishing this goal is the tracking and reporting of safety statistics, the Task Force concluded that the collection and reporting of safety statistics will enable AWO members to measure their individual safety performance and compare it to the performance of the industry as a whole. The Task Force considers the collection and reporting of safety statics to be an important component of the continuous improvement cycle. Therefore, the Task Force recommended that AWO members collect, track and report the number and rate of fatalities, falls overboard, recordable and lost-time injuries and man-hours, and the number and volume of spills into the water from towing vessels and barges.

The Task Force discussed the past concerns expressed by some AWO members regarding the confidentiality and complexity of safety statistics reporting. In order to address these concerns, the Task Force recommended anonymous reporting to a third party (such as the Hile Group, which currently manages the Voluntary Safety Statistics program). AWO should receive only aggregate data and a list of reporting companies, not individual company data. AWO would use the aggregated data to benchmark the industry's overall safety performance, as a means to identify safety areas needing improvement.

Objective

The tracking of safety data is currently required by the RCP; however, reporting of this data is not currently required. The AWO Voluntary Safety Statistics Program has been in place since April 2003, yet the number of companies participating in this program remains less than ideal. In the future, the Task Force has recommended that collection and reporting of safety statistics be made one of the conditions of AWO membership, making it essential that AWO develop a simple process and clear criteria that will facilitate the process for all AWO members, address the amount of time required to collect and report this data, and remove any remaining barriers to collection, tracking and reporting. To accomplish this objective, the Task Force has recommended the establishment of this Safety Statistics Working Group to develop a user-friendly safety statistics reporting system for AWO carrier member companies.

Working Group Tasks

The AWO Safety Statistics Working Group will conduct the following tasks:

1) Understand the current AWO Voluntary Safety Statistics Reporting Program, including: the methodology, content and organization of the current report; the means of reporting data; and, challenges in collecting the data.

2) Research and understand successful safety statistics reporting programs in use in the maritime industry, and other like industries, as possible models for the AWO safety statistics reporting program.

3) Understand the array of existing government data collected on the tugboat, towboat and barge industry, and other transportation sectors, by:
   a. Coast Guard
   b. Bureau of Labor Statistics
   c. Army Corps of Engineers
   d. Federal Railroad Administration
   e. Federal Aviation Administration

4) Seek input from towing industry, government and other industry experts on their view of the essential elements of a successful safety statistics reporting program.

5) Research the best practices utilized to facilitate company compliance with other required safety statistics reporting programs.

6) Develop a proposed program of statistics collection, tracking and reporting that will allow all AWO members to successfully implement and comply with the new requirement. Present the recommended program to the Executive Committee and Board of Directors to make reporting of safety statistics a requirement of the RCP. This program might include:
   a. An online reporting form that includes formulas and dropdown menus to make reporting of safety data simpler, less time consuming and more accurate; and
   b. A modernized Safety Statistics Manual to include the new reporting methodology.

7) Develop an outreach program to ensure AWO members are fully aware of and understand how to use the new reporting methodology before the new requirement takes effect.

Membership

Safety Statistics Working Group members will include:

Co-chair:	Fredrick Nyhuis, Marathon Petroleum Company, LP
Co-chair:	Jeffery Parker, Allied Transportation Company

Group Members:

Jason Adams, Ingram Barge Company
Ron Corigliano, Campbell Transportation Company, Inc.
Angie Fay, Blessey Marine Services, Inc.
Keith Fontenot, SeaRiver Maritime, Inc.
Joe Garuccio, American River Transportation Company
Dave Hammond, Inland Marine Service
Susan Hayman, Foss Maritime
Julie Hile, Hile Group
Steve Huttman, G&H Towing Company
Tim Kline, Harley Marine Services
Buckley McAllister, McAllister Towing
Tim Robinson, SCF Liquids
Bob Roosevelt, Vane Brothers Company
Jim Smith, Magnolia Marine Transport Company
Tom Smith, Canal Barge Company
Mike Vitt, E.N. Bisso & Son, Inc.
Mike Weisend, AEP River Operations
Robert McFeeley/Ketra Anderson, Crowley Maritime
Dave Riches, Kirby Corporation
Heather Williams, Florida Marine

Timeline

The Working Group will hold its first meeting in September 2012 and deliver its interim report to the AWO Board of Directors at the 2012 Fall Convention.

The American Waterways Operators
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November 5, 2012

MEMORANDUM

TO: AWO Safety Statistics Working Group

FROM: Brian Vahey

CC: Lynn M. Muench

RE: AWO Safety Statistics Work Group Meeting September 27-28

The AWO Safety Statistics Reporting Work Group ("Work Group") held its first meeting on September 27-28 in Arlington, VA. Work Group members present at the meeting included: Fred Nyhuis, Marathon Petroleum Company (Co-chair); Jeff Parker, Allied Transportation Company (Co-chair); Ron Corigliano, Campbell Transportation Company, Inc.; Keith Fontenot, SeaRiver Maritime, Inc.; Dave Hammond, Inland Marine Service; Susan Hayman, Foss Marine Holdings; Julie Hile, Hile Group; Tim Robinson, SCF Marine, Inc.; Tom Smith, Canal Barge Company; Robert McFeeley, Crowley Maritime Corporation; Heather Williams, Florida Marine Transporters; and, Jason Wisneski, Dann Marine Towing, LC.

Guests at the meeting included Hazem Arafa, American Petroleum Institute; Robert Dodd and Michael Karr, National Transportation Safety Board; Bradford Johnson and Dan Roczniak, American Chemistry Council; Ed McNamara, U.S. Army Corps of Engineers; Kevin McSweeney, American Bureau of Shipping (via conference call); Jeffrey Moller, Association of American Railroads; Paula Reever, Shipbuilders Council of America; and, Jill Stock, Florida Marine Transporters.

Work Group members unable to attend the meeting included: Jason Adams, Ingram Barge Company; Joe Garuccio, American River Transportation Company; Steve Huttman, G&H Towing Company; Tim Kline, Harley Marine Services; Buckley McAllister, McAllister Towing; Andy Norval, Blessey Marine Services, Inc.; Jim Smith, Magnolia Marine Transport Company; Mike Vitt, E.N. Bisso & Son, Inc.; Mike Weisend, AEP River Operations; and, Dave Riches, Kirby Corporation.

AWO Safety Statistics Reporting Program Purpose

The AWO Future of Safety Leadership (FOSL) Task Force directed the Work Group to develop a simple process and clear criteria to facilitate member participation in a program that collects, tracks, and reports industry safety statistics. The FOSL Task Force proposed that participation in this program eventually be made a condition of AWO membership.

The Work Group discussed what it believed to be the key goals, or purposes, of such a program. In general, the Work Group recommended that the reporting program:

- Must provide information that members can use to continuously improve safety, security, and environmental stewardship;
- Must collect information in the form of outputs and anonymous data sets; and,
- As a secondary benefit, the reporting program should provide benchmarking information so that AWO can represent the towing industry's excellent safety and environmental record in its advocacy outreach.

If the reporting program meets these goals, the Work Group believes that it will assist AWO members in achieving company-wide continuous improvement, as measured by the steady reduction in incidents; provide AWO with the ability to develop and share lessons learned; aid AWO and its safety committees in identifying industry safety trends; and, create opportunities for internal and company-to-company training and mentoring.

Essential Elements of Successful Reporting Programs

The FOSL Task Force recognized that other industry sectors have successfully implemented safety statistics reporting programs, and recommended that the Work Group consult with safety experts in other industries to further define the characteristics and scope of AWO's reporting program.

AWO invited guest speakers from other industry associations to brief the Work Group on their own reporting programs. Government representatives were also present to provide guidance on the essential elements of successful reporting programs. Individual presentations are included in Appendix A of this memo. In general, guest speakers stressed that AWO must:

- Clearly define why it is collecting data;
- Make data reporting as simple as possible;
- Publicize the program extensively and incentivize members to participate;
- Keep data anonymous; and,
- Provide regular meaningful feedback on the data and how it is being used.

Guest speakers also stressed the importance of promoting the value of safety statistics reporting to all levels of member companies, from senior executives to deckhands.

Using this guidance as a model, the Work Group developed the following recommendations for essential program elements. AWO must:

- Clearly define why the association is collecting this data and how it will be used;
- Ensure support for the program from senior-level management down;
- Ensure and publicize that data is reliable, anonymous, and collected from the entire AWO membership;
- Make reporting as simple as possible;
- Provide regular, meaningful feedback to members on the data they are reporting; and,
- Publicize the program early and often and consider ways to incentivize participation.

Reporting Process

The Work Group recommended that AWO develop an anonymous, user-friendly, web-based data collection format, measuring an agreed-upon set of incidents and related variables. Consistent with the FOSL Task Force recommendation, reporting would be anonymous, and made to a third party, not AWO. The Work Group clarified that AWO should only receive aggregate data and a list of reporting companies, not individual company data.

Additionally, the Work Group recommended that:

- The reporting program be audited regularly;
- Statistics are collected quarterly to ensure there is enough data to effectively guide industry safety initiatives and achieve continuous improvement;
- Data is categorized based on operating sector, for example coastal/coastal harbor and inland/inland fleeting; and,
- Reporting requirements are phased-in over time.

Phase-In Compliance

The Work Group recommended that AWO develop a phase-in compliance process to help ensure that the program continually increases its value as a safety tool without placing such reporting burdens on AWO members that they withdraw association membership.

Under Phase I of the program, AWO members would report general incidents. The Work Group has proposed the following categories:

- Fatalities
- Falls overboard
- Recordable incidents
- Lost-time incidents
- Total man hours
- Spills to water (number of incidents)
- Spills to water (volume)

In Phase II and beyond, the Work Group recommends that AWO expand the complexity of the program to capture incidents by category (operational incidents, personnel incidents, and

environmental incidents) and by "drill-down" details, including but not limited to the type of incident (e.g. slips, trips, falls), the activity being conducted at the time of the incident, and the body part(s) where the injury was inflicted.

Statistics Reporting as Part of Overall AWO Safety Vision

The Work Group stressed that the safety statistics reporting program is not intended to create new bureaucracy or administrative hurdles for AWO members. To ensure the program genuinely raises the bar of safety in the towing industry, the Work Group recommended that it be developed with a full awareness of other industry safety initiatives being conducted and careful consideration by Work Group members for how the Work Group, and the reporting effort generally, can interact with these other AWO safety efforts.

- Above all, the program must be guided by the vision of the FOSL Task Force;
- It must be aligned with the Interregional and Coastal Safety Committees;
- Safety Statistics Reporting Work Group members must regularly collaborate with other safety working groups recommended by FOSL, including but not limited to the Near-Miss Reporting Work Group, the Lessons Learned Work Group, and the Towing Vessel Self-Assessment Work Group;
- The legality of the Work Group's reporting vision must be reviewed and validated by the AWO Counsels Working Group; and,
- The reporting program must be consistent with current requirements under the AWO Responsible Carrier Program and future requirements for towing vessel inspection under Subchapter M.

Next Steps

In order to provide additional definition to the overall elements and strategies identified by the Work Group and outlined in this memo, Work Group members have proposed creating subgroups to address the following:

- Subgroup #1: Describe the elements of a web-based reporting tool
- Subgroup #2: Identify categories of data members must report
- Subgroup #3: Identify the form the data takes to ensure actionable info
- Subgroup #4: Develop the phase-in schedule

For more information on the proposed subgroups, see Appendix B.

The Work Group will update the AWO Board of Directors on the progress it has made at the 2012 Fall Convention and plan to deliver its interim recommendations by the 2013 Spring Convention.

Appendix A

Appendix B

SAFETY DOCUMENTS

Executive Summary of Northwestern University's Phase IV Final Report

Confidential

Final report
Executive Summary
For full report, please visit:
http://www.americanwaterways.com/index/AWOPhaseIVFinalReport.pdf

Phase IV of an ongoing program to develop strategies to reduce fatigue and risk on towing vessels and to improve the health of crewmembers operating vessels 24/7 (March 2011 – May 2012)

Large scale survey of sleep quality and general health in wheelhouse towing vessel crewmembers on American waterways

Submitted:
June 1, 2012

Prepared by:
Dr. Kathryn Reid
Dr. Fred Turek

Center for Sleep and Circadian Biology
Transportation Center
Department of Neurology
Northwestern University

A. Prologue

This Phase IV study represents the latest phase of studies that started in 2008 on issues related to fatigue and sleep in crewmembers on towboats on inland waterways. Phase I consisted of the preparation of a White Paper that was an analysis of published studies and data on schedules and fatigue of crewmembers on board vessels throughout the maritime industry, i.e., blue/open water as well as inland waterways where vessels must be maintained 24/7. Since it was apparent that the scheduled duty times were often split into two periods of work over 24 hours (and thus two periods of rest per 24 hours) for maintaining vessel activities 24/7, the Phase I White Paper also included an analysis of the scientific literature on the use of naps in association with anchor sleep (i.e., a split sleep schedule) for reducing fatigue and optimizing performance. The completion of the Phase I White Paper led the Northwestern University investigators to conclude that any viable strategy for an industry that has two crewmembers who must be on duty collectively for 24 hours over many days (i.e., crewmembers must be on duty and maintain high levels of vigilance for a total of 12 hours each 24-hour day) would require anchor sleep/nap sleep strategies to manage fatigue and reduce risk on towing vessels.

In order to develop a better understanding of the sleep-wake schedules and sleep amount of the crewmembers on board towing vessels that were using a 6 on: 6 off: 6 on: 6 off duty schedule, NU investigators rode on five towing vessels and collected data on crewmembers in Phase II studies supported by seven different towing vessel companies in 2009. In 2010, with support from the AWO, we carried out a Phase III study that collected sleep time and sleep duration data from crews on ten different towing vessels. The results of these studies are summarized in our Phase II and Phase III reports.

The results from the Phase II and Phase III studies were very consistent between the studies and gave us a clear understanding of 1) how many hours crewmembers were actually in bed during each of the six-hour sleep opportunities and 2) how much sleep time (based on actigraphy data) they were actually obtaining. It should be noted that such objective data on time in bed (TIB) and total sleep time has never been collected and reported before for crewmembers on inland waterway towing vessels.

Findings from the Phase II and III studies consistently indicate that while wheelhouse crewmembers appear to be spending an adequate time in bed each day, they are not able to obtain more than about 6.5 hours of sleep per 24 hours. While a strength of our previous studies was the objective measures used to determine sleep/wake times, it was not possible to study a large number of crewmembers over an extended period of time. In the Phase IV studies, we set out to examine a large sample of wheelhouse crewmembers (captains and pilots). Our previous

studies indicated that there is no difference in the sleep duration of crews on the front (Captains) and back (Pilots) watch. This was unexpected as the front watch crew had a rest period during the night when the circadian clock is signaling the body to sleep, and as such, it should be the best time to sleep. The rationale for studying only the wheelhouse crew in our Phase IV work was that given the small number of wheelhouse crews previously studied (19 in Phase III), it is difficult to identify factors that may be impacting sleep in these wheelhouse crews. The aims of the Phase IV studies were to 1) determine and compare the sleep patterns of wheelhouse crews both when on extended vessel duty (21-28 days) as well as when at home for an extended period of time and 2) use online technologies to identify factors that may be influencing sleep quality in a large number of wheelhouse crewmembers. An additional aspect of this study was to take the opportunity to disseminate the education materials developed during the Phase III studies to a much larger number of crewmembers and to carry out follow-up analyses to determine the effectiveness of such constant (online) educational interactions for increasing total sleep time for crews on the front and back watch. In these Phase IV online studies we also obtained data on body weight and BMI and collected many more measures of sleep and fatigue levels using a number of scientifically validated tests (see Appendix B).

B. Executive Summary

B-1. Goals and study design

The primary aims of this study were to use online technologies to collect data on a large number of wheelhouse crewmembers to determine:

a) Sleep habits both when on duty and when at home

b) Levels of fatigue and subjective measures of sleep quality

c) Attitudes toward the importance of obtaining quality and sufficient sleep as well as barriers to obtaining sufficient sleep

d) Risk for sleep apnea and levels of obesity and to relate these indicators to sleep time and quality

In order to achieve these goals, 163 Captains and Pilots from 27 AWO membership companies were studied between June 2011-Febuary 2012 for an approximately two-month period: one month at home (Session A) and one month on the vessel (Session B). By studying wheelhouse crewmembers (Captains and Pilots) both on the vessel and off, we were able to identify whether the individuals' sleep is impaired in general due to some underlying reason (e.g., sleep disorder, stress, health, social factors, perceived need for sleep) or due to being on the vessels or the shift schedule.

To determine daily sleep duration and quality and to assess sleepiness/fatigue levels, wheelhouse crewmembers were asked to complete a number of sleep logs and fatigue scales after every sleep period during the first and third week of each section of the study. To determine general factors about sleep, sleep quality and sleepiness, crews were asked to complete a series of questionnaires relative to their time on the vessel and at home. At the end of the two-month period, crewmembers were provided with the educational materials developed during the Phase III studies.

B-2. Results

B-2a. Sleep on duty and at home

A major finding from the present study was that when on duty, crews on the Captain's or Pilot's watch reported similar time in bed (TIB) and sleep duration; these findings confirmed our objective measures of TIB and sleep duration based on actigraphy from our onboard Phase II and III studies. A second major finding was that there were no differences in reported sleep duration for crews when at home or on the vessel. Indeed, we found that crews spent

significantly more TIB when on duty than when at home, indicating that the 6:6:6:6 square watch schedule is allowing crews sufficient TIB. A third major finding was that while the TIB was similar in crewmembers when on duty in our onboard studies (Phase II and III) compared to our survey-based study (Phase IV), the crewmembers reported much longer sleep duration based on survey data when compared to our objective (actigraphy) data from studies in Phase II and III.

B-2b. Subjective assessment of sleep quality and fatigue

A major finding based on the Pittsburgh Sleep Quality Index (PSQI) was that crews on the Pilots' watch reported that they slept worse than crew on the Captains' watch. Importantly, a second major finding from sleep diaries was that on average, crews reported they slept worse while at home than on the vessel for the first seven days at each location. Both front watch and back watch crews reported poorer sleep quality, not sleeping long enough, not sleeping deeply and finding it more difficult to wake up while at home compared to on the vessel ($p<0.03$). Front watch crews also reported a greater number of awakenings at home, and back watch crews reported finding it more difficult to fall asleep at home (Figure 9) ($p=<0.03$).

In general, there were no differences in the levels of fatigue or sleepiness between the watches when on board. But there was a difference in sleepiness as determine by the Karolinska Sleepiness Scale prior to sleep when comparing crews on duty and at home. On average, both front watch ($p=0.001$) and back watch ($p=0.03$) crews were slightly more sleepy prior to sleep at home than when on the vessel but had similar levels of sleepiness after sleep. This difference prior to sleep is likely the result of the differences in time awake at home compared to on the vessel, since crews typically reported only one sleep period a day at home and two sleep periods a day while on the vessel.

B-2c. Determine attitudes and barriers for obtaining sufficient sleep and quality sleep

Much more analysis, including an evaluation of many different survey findings on an individual basis, is required before we can address these issues.

B-2d. Risk for sleep apnea and levels of obesity

Based on the sleep apnea risk questionnaire (the Berlin Questionnaire), 41% of the crewmembers were at a high risk for sleep apnea, which is higher than in the general population of similarly-aged males (32%). Importantly, the body mass index (BMI), an important health indicator for risk of cardiometabolic disease and sleep apnea, was in the obese range for a high percentage of crewmembers (47.9% vs. 33.8% of the normal population) while the level of morbid obesity (BMI>40) was nearly double that of the normal population (10.1% vs. 5.7%). Given the high percentage of crewmembers at high risk for sleep apnea, and that this disorder

carries a risk of both poor health and alertness outcomes, careful consideration of how to use the findings of this study to implement screening and risk mitigation strategies should be considered. Indeed, a proactive intervention by the industry in addressing this important risk factor is warranted. Further study is also needed to determine the correlation between obesity/sleep apnea and TIB and sleep duration and quality, as well as levels of sleepiness.

B-3. Future Plans/Directions

The data we have collected in Phases II and III when on board towing vessels, as well as the survey data collected online in Phase IV from a large number of crewmembers, represents a rich unprecedented set of data that is expected to lead to three to four full-length publications (we have already presented some of the results at scientific meetings and in abstract form). In addition, we believe these data now represent a foundation of knowledge that can be used to develop intervention strategies and a plan for the development of a scientifically based Fatigue Management Plan and System for the towing vessel industry. We recommend that in the future, further studies should involve:

a) A more extensive analysis (data mining) of the large datasets we now have access to,

b) Possible Phase IVa studies that could continue our efforts to collect data from the ~150 crewmembers who were fully engaged in the Phase IV study, and

c) Taking our present results to the next level and move from collecting data from crewmembers to intervention and fatigue management levels.

Possible future funding opportunities for further studies are described in section B-3d below.

B-3a. Further analysis of Phase IV data

Funding for the Phase IV studies allowed us to collect an enormous amount of data. While Drs. Reid and Turek will now be able to use the tables and figures in this Phase IV final report for reporting our initial results in the scientific literature, further funding would allow for a much more extensive analysis. For example, we are now in a position to go back into the data to determine if sleep time or quality relate to BMI or age of the captains and pilots. The current report outlines just a small portion of the data collected as part of this study of captains and pilots on American waterways.

In a sense, we have just scratched the surface of the data we only finished collecting in February 2012, and there is now an opportunity to hire statisticians and large dataset analysts to probe our unprecedented dataset.

B-3b. Extension of Phase IV studies

We have information on sleep, fatigue, health and age on 163 captains and pilots who participated to one degree or another in the Phase IV studies, and we are in a position to reconnect with these wheelhouse crewmembers for follow-up studies to determine if the educational materials and/or just participating in the Phase IV studies made the crewmembers more cognizant of the importance of obtaining sufficient sleep for health and performance and to manage their fatigue. Such information could be valuable for determining factors that could be incorporated into a Fatigue Management System and for the development of Fatigue Management Systems for the towing vessel industry.

B-3c. Development of a Fatigue Management System

Again, depending on funding levels, a number of steps could be taken to develop a plan that in 3-5 years would lead to a comprehensive scientifically based Fatigue Management System for all the members of the AWO. Such a plan would have as a goal for the AWO to be “out-front” of the regulators in developing a Fatigue Management System and could include, but not be limited to:

- Holding a two-day workshop with the leading scientists in the US who work in the area of sleep management, as well as health and safety officers of AWO companies and perhaps members of the Coast Guard. A major objective of such a workshop would be to come to a consensus on a 3-5 year Fatigue Management Plan that would involve research studies, development of countermeasures and individual fatigue and performance profiles that could increase safety and performance as well as the health of crews.
- Renewed attempts to measure how interventions affect actual performance in a real-world setting or in studies involving high-fidelity simulators. Such studies, would be particularly useful and important in comparing the effects on fatigue and performance for crews on different 2-watch schedules such as 6 on:6 off:6on:6 off vs. 7 on:5 off:5 on:7 off vs. 8 on: 4 off: 4on: 8 off. To date no such comparisons have been made in either real on board or simulated studies. A recent and in depth study (The European HORIZON Project) using simulators to compare the effects of different schedules on fatigue and performance in mariners only compared a 2-watch vs. 3-watch schedule.
- The implementation of a new industry-wide wellness program to combat the high levels of obesity (and presumably sleep apnea and associated cardiometabolic diseases) found in the maritime industry.

- Studies to determine if new technologies are feasible for use in the maritime industry that would allow individual crewmembers to track their own levels of fatigue and sleep habits in an attempt to change the culture in the maritime industry when obtaining sufficient sleep and making good health become as much a part of the everyday concerns of each mariner about their sleep and levels of fatigue as has occurred with issues surrounding safety. An example of such a new technology is a new portable, easy-to-use sleep- (EEG measurement) recording device made by Zeo. One of the latest versions of this device costs about $100 and can be used with an iPhone. It provides a great deal of information about the quantity and quality of one's sleep, and there is evidence it is a motivational tool for making the obtainment of quality sufficient sleep time a high priority in the same way that blood glucose tracking devices motivate a large percentage of diabetics and even pre-diabetics (i.e., individuals showing signs of insulin resistance) to closely monitor and control their blood glucose levels in order to prevent or control their diabetic condition.

B-3d. Future External Funding Opportunities

While further funding from the AWO and/or individual towing vessel companies could be used for future studies and in the development and implementation of a comprehensive scientifically based AWO Fatigue Management System, in this section, we are or will seek external funding for future studies aimed to combat fatigue and adverse health due to insufficient sleep among mariners in the towing industry.

- National Cooperative Freight Research Program (NCFRP)

  With the support of the AWO, the team at Northwestern submitted a proposed "Problem Statement" to the National Cooperative Freight Research Program (NCFRP) in August 2011. While this proposal has been approved for funding by the NCFRP, Congress has yet to pass a new Transportation Bill for over two years, so it is not clear if funds will ever become available. If funded, this NCFRP study would allow the Northwestern team to mine the unprecedented amount of real-world data we have obtained on the sleep habits and measures of fatigue in wheelhouse crewmembers in our Phase IV studies. In particular, the aims of the NCFRP study are: a) assess whether there were any changes in behavior in crewmembers following their participation and their receiving educational material in our Phase IV survey study, and b) implement recommendations for how best to use an anchor sleep/nap strategy for crews working split-shift schedules. The data collected from this study would be assessed in combination with data from the Phase IV study in order to determine whether there has been any change in behavior. It will also allow us to identify and categorize those who have and those who have not changed

behavior and to what degree. By identifying these groups of individuals it will be possible to tailor future programs for intervention. This approach could provide a model for other industries facing similar challenges.

- Other external funding opportunities

  There are a number of federal agencies that support research related to fatigue in the workplace. Our plan is to prepare new proposal to agencies such as National Institute of Occupational Safety and Health (NIOSH) and the Centers for Disease Control (CDC).

Speaker Biographies

Christopher M. Parsonage

President
Quality Auditing, LC

Christopher M. Parsonage is President of Quality Auditing LC, specializing in management and vessel audits of inland towing vessels. Chris graduated from the University of Missouri in 1977 with a Bachelor of Science Degree in Accounting. After graduation, he began his career with MEMCO Barge Line, Inc., working with his father, Noble C. Parsonage. Chris was responsible for directing the operations and strategic growth of MEMCO Barge Line, Inc. and its wholly owned subsidiary, Elmwood Marine Services, Inc. He led an aggressive expansion of MEMCO and Elmwood Marine's operations prior to MEMCO's sale to Carolina Power & Light in 2001. Chris has held many leadership positions in industry organizations, including Former Chairman of the American Waterways Operators, and Secretary Treasurer of the Marine Transportation Council.

CAPT John J. Arenstam

Chief, Western Rivers Division for the 8TH CG District
United States Coast Guard

CAPT John J Arenstam, a native of Plymouth, Massachusetts, graduated from the U.S. Coast Guard Academy in 1987 with a Bachelor's degree in Mathematics and Computer Science. Upon receiving his commission, CAPT Arenstam was assigned as Operations Officer aboard USCGC MARIPOSA (WLB 397) in Detroit, MI. In 1989, he was transferred to Coos Bay, OR, where he served as Operations Officer aboard USCGC CITRUS (WMEC 300). In 1992, CAPT Arenstam transferred to the Fifth Coast Guard District in Portsmouth, VA where he worked in the Aids to Navigation branch. From 1995 through 1998 CAPT Arenstam served as Commanding Officer of USCGC PENOBSCOT BAY (WTGB 107) out of Governor's Island, NY and Bayonne, NJ.

In 1998 he transferred to Coast Guard Headquarters in Washington DC where he worked in the International Affairs Office. As part of his duties CAPT Arenstam traveled to sixteen countries facilitating international training and technical assistance. While assigned to USCG Headquarters, CAPT Arenstam earned a Masters Degree in Operations Research from The George Washington University. CAPT Arenstam moved to Kodiak, AK and assumed command of USCGC FIREBUSH (WLB 393) in July of 2001 through July 2003. CAPT Arenstam has served as AtoN Program Manager in USCG HQ, and the Chief of Waterways Management Branch for the 8TH CG District. CAPT Arenstam's most recent assignment was as Deputy Sector Commander at Sector New Orleans. In Aug 2012 CAPT Arenstam assumed his current duties as Chief, Western Rivers Division for the 8TH CG District.

CAPT Arenstam's wife Rose Mary is a native of Mobile, AL. They have three children Joshua (21), Julia (18), and Jacob (15).

Speaker Biographies, Cont.

Barry Strauch, Ph.D.

Chief of the Major Investigations Division
National Transportation Safety Board

Dr. Strauch is a Chief of the Major Investigations Division of the National Transportation Safety Board's Office of Marine Safety. From 2000-2003 he was the Assistant Director for Instruction of the NTSB Academy. From 1995 to 2000 he was the Chief of the Human Performance Division of the NTSB's Office of Aviation Safety.

He joined the Safety Board as a human performance investigator in 1983 and became an investigator-in-charge of major aviation accident investigations in 1986. In 1990 he became the Deputy Chief of the Major Investigations Division in the Office of Aviation Safety before becoming Division Chief in that Office in 1993. In 1992 Dr. Strauch also became the head of the program that trains the NTSB's aircraft accident investigators.

Before joining the Safety Board, Dr. Strauch was on the faculty of the University of Louisville where he taught Psychology, and at Embry-Riddle Aeronautical University, where he taught Psychology and conducted human factors research in aviation. He was an adjunct faculty member in the Psychology Department of George Mason University and in the Aviation Safety and Security Certificate Program at George Washington University. He is the author of the book, "Investigating Human Error: Incidents, Accidents, and Complex Systems," which was published by Ashgate Publishing in August 2002, and of numerous papers and presentations.

He earned a B.A. in Psychology from New York University, and an M.S. and Ph.D. degrees in Educational Psychology from the Pennsylvania State University. He holds an FAA commercial pilot certificate with instrument airplane rating and a certified flight instructor certificate-with instrument airplane rating.

Will Kraft

W&M Kraft, Inc.

Will Kraft held a full range of technical and management positions in DuPont including engineering, supervisory, sales, manufacturing, and business. For the past fifteen years this operations and business background has enabled Will to assist individuals and businesses to continually improve operational excellence through SafeOperations.

Will's focus is on how people approach and do work, integrating safety, quality, cost, productivity, environment and relationships to achieve Operational Excellence or Zero Harm.

Will and his wife Marie live in South Carolina and enjoy their hobby farm and woodworking when not traveling and working with businesses throughout the world.

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