ALEUTIAN ISLAND MARINE FIRE FIGHTING AND SALVAGE OVERVIEW

BACKGROUND

2012 VESSEL TRANSITS OF UNIMAK PASS

In 2012, a total of 1,961 deep-draft vessels made 4,615-recorded transits through Unimak Pass.

Transits by Direction

The data for Unimak Pass indicate that this route through the Pass is more commonly used for westbound voyages:

- 3,109 (67%) of the recorded transits through Unimak Pass were WESTBOUND
- 1,369 (30%) of recorded transits through Unimak Pass were EASTBOUND
- 137 (3%) transits were unknown

In addition to Unimak Pass, vessels may also use other passes or, more commonly, stay south of the islands. To provide a general illustration of the number of vessels that may be moving south of the Aleutian Islands, we assume that vessels identified as traveling twice in the same direction consecutively also made a trip in the opposite direction in between those recorded journeys through Unimak Pass. Based on this assumption, there were 963 eastbound voyages south of the Aleutian Islands and 87 westbound voyages in addition to the recorded transits reported above. This assumption may still miss some vessels, however, if they make a round trip between East Asia and Western North America without passing through Unimak Pass in either direction. It may also errantly include vessels that actually did travel elsewhere in the world before returning to North Pacific transit. It is therefore a rough estimate for illustrative purposes only. These vessels are not included in any estimate of the system costs developed for the project, as the numbers are rough estimates only.

Vessel Transits in Innocent Passage

For 2,462 (53%) of recorded transits through Unimak Pass, vessels were in innocent passage and would not be required to have a U.S. VRP or NTVRP plan that includes the Western Alaska Captain of the Port Zone. Another 2,016 transits would be subject to U.S. VRP or NTVRP (as of 2013) requirements for the area, because they traveling to or from a U.S. port (or were U.S. flagged vessels) for at least one recorded voyage through the region that year. Regulated status could not be determined for 137-recorded transits.

Unique Vessels in Innocent Passage

A total of 1,961 unique large vessels were recorded passing through Unimak Pass in 2012. Of these: 1,045 vessels would have been subject to VRP or NTVRP regulations for at least one transit during the year. (Vessels making multiple transits across the North Pacific may have different ports of departure and destinations.) There were 853 vessels that transited Unimak Pass only in innocent passage (i.e., never to or from a U.S. port when on this route). For 63 vessels, AIS data was not conclusive as whether they subject to VRP regulations or in innocent passage. This is summarized in Table 3.

Table 1: Summary of unique vessels transiting Unimak Pass in 2012

REGULATED STATUS	# of Unique Vessels
Vessels in U.S. trade only, subject to VRP regulations	684
Vessels in both U.S. trade and innocent passage, subject to VRP regulations for at least one voyage	361
Vessels that would be subject to U.S. regulations for at least one transit through Unimak Pass based on 2012 data	1045
Vessels in innocent passage only	853
Vessels for which regulated status is unknown	63
TOTAL unique vessels transiting Unimak Pass in 2012	1961

RESPONSE TIMES FOR TUGS OF OPPORTUNITY

Historically, there has not been a dedicated emergency tow vessel in the Aleutian Islands to assist a distressed ship. However, tugs of opportunity or tugs that are available in the region but not dedicated to rescue services may be able to aid a distressed ship if they were willing and able to diver their activities.

A study was conducted for the Aleutian Island Risk Assessment, which examined the amount of time it would take a potential tug of opportunity to reach six hypothetical incident locations and whether the tug would have sufficient bollard pull to control a large container ship once it reached the location (The Glosten Associates, 2013a and 2014). A supplemental study analyzed actual tug location data for a one-year time period and extrapolated the information to illustrate the availability and capability of towing vessels in service in the Geographic Zone to arrive on-scene and assist disabled vessels at the six scenario locations. Travel time estimates were derived from actual towing vessel locations based on a weekly sampling of AIS data in 2012.

Eighty-six tugs were included in the analysis, plus two additional vessels, which were treated as special cases: the USCG cutter Alex Haley and the tug Resolve Pioneer. For all scenarios, the tug most likely to reach a distressed vessel in the Aleutian Islands are located in the eastern Aleutians (near Dutch Harbor), or even farther east, near Kodiak or in Bristol Bay. Of the 86 tugs identified in the AIS data, 23 of them were not useful in any scenario because for each incident site, sea state, and week it was present; a more capable tug would have arrived first. Of the remaining tugs, most of them were useful only a handful of weeks, with only one tug, the James Dunlap showing up as a potential responder in more than 12 weeks.

Tug availability was not consistent for the one-year period analyzed. A fully functional tug with greater than 80 MT bollard pull was present in about half the weeks of the analysis. More tugs were available in late-July and August 2012; tugs with bollard pull greater than 100 MT were most available in July-August and again in November-December, but were rare during the rest of the year.

Even in extreme weather, a tug of opportunity could usually be expected to reach a distressed vessel within 12 hours near Unimak Pass, but a distressed vessel in the western Aleutian Islands area would likely wait two or more days for a tug of opportunity rescue. Adequate emergency towing assistance could be delayed or impossible in very stormy weather, especially if relatively large tugs were not available.

Considerations for Rescue Tugs:

As part of the Aleutian Islands Risk Assessment, it was required to identify the towing performance capacity required of a tug to handle existing vessels in the prevailing weather conditions. Two vessels were identified as being the largest typically found on routes passing close to the Aleutians; a 600,000 bbl. crude oil tanker and a 68,000 DWT container ship. The evaluation was run for a range of conditions that might be found in the Aleutians. Winds from 20 to 60 knots with sea states to match were examined. A 40-knot wind speed and its associated sea state 6 were used for specifying the minimum required bollard pull.

At higher wind speeds, the wind forces dominate the solution, which makes the container ship the limiting case for turning and arresting drift. The three operations are:

Arresting drift; the tug force required to prevent the vessel from drifting down wind when it is beam to the wind and waves

Turning; the tug force required to turn a drifting vessel into the wind and waves without towing crosswind to develop forward speed

Towing; the tug force required to tow the ship to windward at 1 knot.

Because the forces on the vessel are greatly reduced with the bow pointed into the weather, the strategy for this analysis was to turn the vessel while allowing drift to leeward. As such, the required tug force would be the worst case of the turning or towing requirements. The simulations show less tug force required than the analysis. For scenario 1, this is due to using the worst case turning moments. These occur with the bow lying about 130-140 degrees off the wind. In the simulations, the vessels start at about 100 degrees off the wind. The hydrodynamic hull forces due to the downwind drift are tending to turn the vessels more broadside than their worst-case positions. The analysis shows that the turning moment is very sensitive to the precise drift angle. Because the actual vessel will be unknown and because both the analysis and the simulation depend on a few representative parameters it was felt that the precise drift angle was unknown and therefore the worst-case tuning moments were used for the tug requirements.

Similarly, with scenario 2, the tug forces from simulation are even smaller than the analytic calculation. Starting the vessel moving allows its own hydrodynamic forces to generate a turning moment and is a good strategy for a smaller tug. The downwind drift allowed by the smaller tugs in the simulations while gaining control of the vessels ranged from 700 to 1100 meters.

The tug force required for turning either of the representative vessels in 40 knots of wind and sea state 6 is approximately 62 MT. The tug force required for towing either of the representative vessels against 40 knots of wind and sea state 6 at 1 knot is about 40 MT. A tug with a rated bollard pull of 81MT will be able to handle either of the representative vessels in these conditions.

An update to the study was conducted in 2014 to using updated vessel traffic data and environmental conditions data for the Aleutian Islands Geographic Zone. There were two notable differences from the original study:

The container ship is larger than in the previous study. Since the wind, forces tend to dominate the calculations and since the container ship has a very large windage area, the tug rating for the design conditions went from 81 MT to 108 MT.

The wave heights are larger in the Aleutians than the average conditions used in the original study. The increased wave heights affect both vessels but tend to be more noticeable for the tanker. The design condition for the tanker has almost doubled the tug rating from 24 MT to 41 MT.

Conclusion

The tug force required for turning either of the representative vessels in 41 knots of wind and 33 foot seas is approximately 80 MT. The tug force required for towing either of the representative vessels against 41 knots of wind and 33 foot seas at 1 knot is about 52 MT. A tug with a rated bollard pull of 109 MT will be able to produce these forces for either of the representative vessels in these conditions.

OIL SPILL RESPONSE AND SALVAGE

This section puts forth a quantitative analysis concerning various response and salvage operations under a wide range of environmental conditions. Safety is always the highest priority in any response and to the maximum extent possible, safety is the factor in response limitations.

The following table summarizes the Response Gap Index (RGI) for each tactic (averaged across all applicable locations), including both, the percentage of time that the RGI is impossible and the corresponding amount of time when a response may be possible.

Table 2: Combined, Average RGI for Each Tactic and Percentage of Time Response May Be Possible

Response Tactic	RGI Year Round (Response Impossible)	Response May Be Possible
Emergency towing	2%	98%
Helicopter Lightering	20%	80%
Open-Water Mechanical Recovery	72%	28&
Near-shore Mechanical Recovery—Unalaska Bay (Daytime Only)	52%	48%
Aerial Application of Dispersants	72%	28%
Vessel Application of Dispersants	64%	36%
Air Observations—Fixed Wing (Daytime only)	18%	82%

OVERALL OBSERVATIONS

Overall, darkness and sea state appear to have the greatest effect on the ability to deploy the response operations.

While this analysis conveys overall that response in the Aleutian Islands region is likely to be precluded or significantly compromised by environmental conditions, the good news is the pollution prevention activities of emergency towing and lightering via helicopter are the most likely activities to be able to be implemented. The RGI for these operations is much lower than spill response activities, though mounting such operations requires that the necessary tow vessels, aircraft, and equipment be available (including adequate storage).

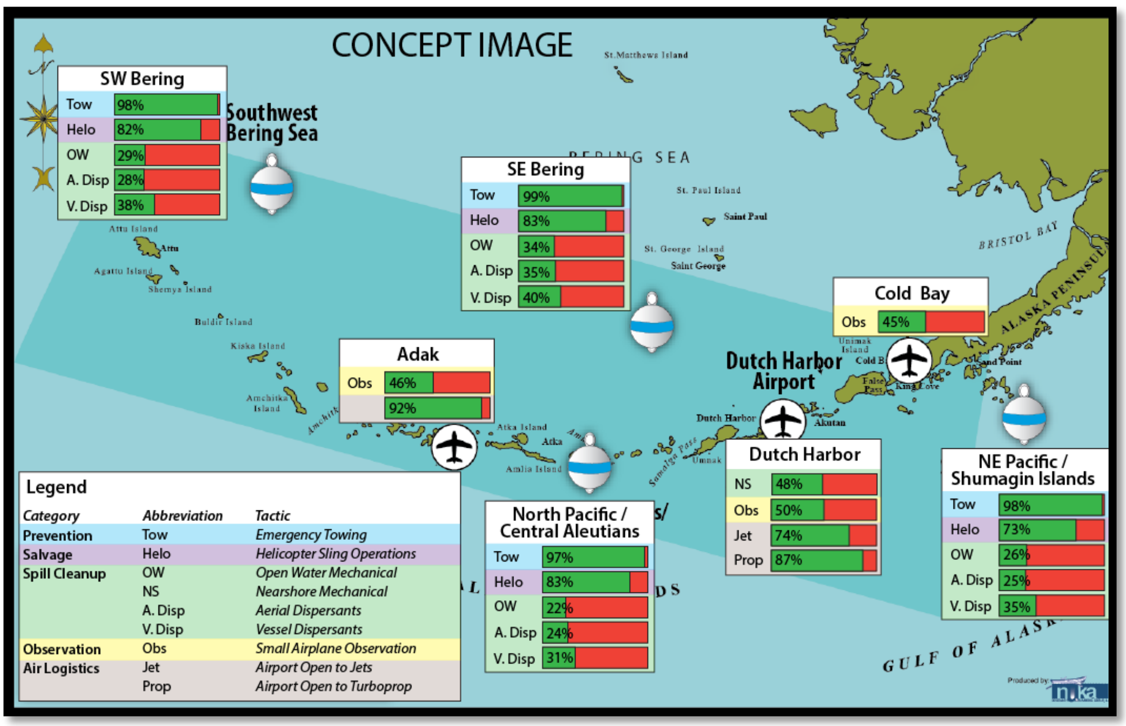
The RGI for aerial observations is also lower than for the response tactics. This at least means that in the event of an incident or accident, responders will be likely to be able to get the information they need in order to plan for response activities when they can ensue, or understand and anticipate the spill trajectory and therefore the resources that may be affected.

The average RGI are similar for spill response operations, which can be expected to be very challenging if they can be implemented at all. All three open-water tactics have large seasonal variations in feasibility, with RGI's rising to 84% to 90% in the winter, meaning that any of these response operations would be, at best, possible less than 20% of the time. Of these, the application of vessel dispersant has the lowest RGI to a small degree.

For near-shore mechanical recovery, marine forecasts were used to represent sea state, which makes this number conservative when compared to the other RGI. At least some of the Aleutian Islands have embayments that offer protection from the sea and these locations always have sensitive habitat and are used as a refuge for many sensitive species. Experience during the Selendang Ayu response proved that near-shore response, shoreline protection, and shoreline cleanup tactics could be successfully implemented, even through the winter months.

Figure 1 shows the results for different types of operations based on different locations within the Aleutian Islands Geographic Zone. This figure also includes an indication of how often key airports are closed to jet and propeller planes based on weather. This provides one indication of the potential challenge to delivering equipment from other regions or moving it around within the region by air.

Figure 1: Various Operations across the Aleutians Geographic Zone



SPECIAL PROCEDURES

On June 1, 1998, in the wake of the November 1997 grounding of the Kuroshima at Summer Bay, the United States USCG COTP for Western Alaska issued Severe Weather Guidelines for the Aleutian Islands enumerating operating rules for offloading and onloading procedures for vessels at anchor. These guidelines are triggered at the "gale force" level of wind strength.

In February of 1999, the freighter Hekifu, which was in the process of attempting to comply with the Severe Weather Guidelines and move away from a vulnerable anchorage, encountered a severe and unpredicted increase in wind force. Subsequently, the anchor broke free of the bottom and the ship grounded on Rocky Point, Iliuliuk Bay.

March and April of 1999 brought a series of hurricane force storms accompanied by unprecedented snowfall and low barometric pressures. In the week between March 17 and March 25, three such storms hit Unalaska Island.

The Hekifu grounding made it apparent that more guidelines were needed to proactively address Port safety, analyze the approaching weather systems and decide on an appropriate course of action before severe weather arrives. These guidelines are divided into four general practices: the severe weather plan, winter ground tackle standards, seasonal anchorage restrictions, and general anchoring guidelines.

MARINE CASUALTY PREVENTION

Port of Dutch Harbor Severe Storm Plan, Winter Rules and General Anchoring Guidelines.

Severe Weather Plan

Upon notification of a storm warning by NWS, the USCG Marine Safety Detachment Unalaska (MSD Unalaska) will contact the Alaska Marine Pilots (AMP), and vessel agents or masters to apprise them of the approaching weather system. The storm system will be tracked by all means possible including satellite photographs available via the National Weather Service Alaska Region internet website http://pafc.arh.noaa.gov/marfcst.php. When MSD Unalaska, AMP, and vessel agents or masters agree that a severe storm is imminent, the Port of Dutch Harbor office will be notified by fax, and the following steps will be taken:

Taking into account the predicted storm strength and wind direction, an analysis will be done by MSD Unalaska and AMP assessing the number of large vessels in the Port, their location, and their vulnerability to the approaching weather.

Upon agreement that certain vessels are at risk from the approaching weather, or from sea states generated by the approaching weather, MSD Unalaska will issue a notice to the agent or master of the at-risk vessels. Any at risk vessel will be directed by MSD Unalaska to prepare for severe weather, weigh anchor and move to sea, or to move to a less vulnerable anchorage. Notices will be faxed to the vessel agent, followed by a phone call to confirm receipt. Agents will relay the notice to the at-risk vessel's master immediately. If the vessel agent cannot reach the vessel master, MSD Unalaska will be immediately apprised that notification to that vessel has not taken place. If a vessel agent cannot be reached, the notice will be relayed directly to the vessel master. The Port of Dutch Harbor will be made aware of the notices by fax.

Upon notification to an at-risk vessel, AMP and the vessel agent or master will coordinate implementation of the notices issued by MSD Unalaska. When multiple vessel departures are necessary, AMP will decide the order of departures, with the most at-risk vessel first. A moored vessel will not normally be required to move unless the severity of the weather clearly poses an imminent danger if the vessel were to remain at the dock.

In the event of unpredicted and sudden weather, MSD Unalaska, AMP, and the vessel agent or master will agree on whether the vessel will be instructed to weigh anchor and put to sea, or be moved to another anchorage. The vessel(s) will make ready to depart before the wind increases to a point that would endanger the vessel, pilot vessel, or the pilot trying to embark or disembark the vessel. The Port of Dutch Harbor will be notified of the agreements by fax.

If the Port Director is not in Unalaska, or is otherwise unavailable, the Acting Port Director will make all decisions as pertains to this plan. The supervising officer, MSD Unalaska under the authority of the COTP, Western Alaska will issue COTP orders to enforce these provisions as necessary.

Winter Ground Tackle Standards for Vessels Anchoring In the Port of Dutch Harbor

Preface: The bathymetry of the Port limits the number of useable anchorages for single screw, non-bow thrusted, non-controllable pitch propeller (CPP) vessels of 85 meters and above. The problem of large vessels anchored in the Port and dragging anchor in severe weather is due to the depth of anchorage, bottom characteristics, the vessel's loaded condition, and insufficient length of useable anchor chain aboard. Vessels with insufficient anchor chain for their anchorage will, depending on wind direction, drag ashore or drag off the assigned anchorage usually into a greater depth of water, further reducing the scope of the anchor chain, suddenly and dramatically decreasing the anchors holding capability.

Given the magnitude of winter weather conditions in and around the Port of Dutch Harbor, vessels without certain equipment are at greater risk in severe weather. Bow thrusters capable of bi-directional thrust control greatly increases the ship's ability to hold position. Controllable pitch propellers (CPP) add a great deal of control by using a vessel's engines to help hold position in severe weather. Placing a second anchor will greatly reduce shear force against the vessel as wind forces the ship to yaw back and forth. The minimum vessel size reflects that larger vessels have greater wind sail area and are more subject to control problems in high winds.

The following ground tackle standards for the Port are strongly suggested. These standards are intended to ensure single screw, non-bow thrusted, non-CPP vessels meet or exceed the minimums to anchor in the area between the months of October 1st through April 30th.

A single screw, 85 meters and larger vessel(s) without a bow thruster, or controllable pitch propeller (CPP), will maintain 10 useable shackles/shots (275 meters) of chain to the water's edge for both port and starboard anchors

A single screw, 85 meters and larger vessel(s) without a bow thruster, or controllable pitch propeller (CPP) that is anchored in the Port that has less than the recommended lengths of anchor chain will make arrangements with a tug of sufficient horsepower and size to control the vessel at all times in all weather conditions for any weather prediction of 45 knots or greater by the NWS while that vessel is at anchor in the Port. A written request for a waiver may be submitted and agreed upon if AMP, the Port and MSD Unalaska agree that the vessel is unlikely to drag anchor in its present location, taking into account the quality and size of the vessel's ground tackle, known vessel characteristics, location of anchorage, water depth and holding characteristics of the bottom.

Vessels anchoring are to take great care in fixing the vessel's position by all means available. In selecting an anchor position, a vessel's loaded condition, depth of water, type of bottom, and the amount of shackle/shots in the water shall be considered. This information must be recorded in the ship's logbook. An accurate swing and drag circle will be plotted on the vessels navigational chart. Those vessels equipped with a radar system capable of plotting this information should maintain a prudent and diligent plot at all times during severe weather conditions.

Seasonal Restrictions of Anchorages: Because of restricted maneuvering room and close lee shores in certain wind conditions, the South Iliuliuk anchorage described as south of a line from Rocky Point buoy east to the opposite shore on a bearing of 118 degrees true, and the Dutch Harbor anchorages, described as west of a line from Rocky Point buoy north to Dutch Harbor Spit Head light, will be utilized for anchorages between October 1st and April 30th by permission only. Permission MUST be obtained from MSD and the Port before anchoring any vessel in these restricted areas. Length of stay, reason for requesting anchorage in a restricted area, and present weather conditions and forecasts will be considered in granting permission to anchor in the restricted areas.

General Anchoring Guidelines

If a vessel at anchor intends to conduct any maintenance of their main propulsion systems that will affect in any way the vessel's ability to maneuver, the vessel agent or master MUST notify MSD Unalaska and the Port of Dutch Harbor and hire a standby tug "of suitable size and horsepower that can control the vessel in all weather conditions". Vessels that have become disabled through mechanical failure MUST notify MSD Unalaska and the Port of Dutch Harbor, and provide a detailed synopsis of the failure and an estimated time to affect repairs. A standby tug "of suitable size and horsepower that can control the vessel in all weather conditions" will be required for these vessels as well.

When a vessel has another vessel alongside while at anchor, and is planning to disable their Main Propulsion Systems for maintenance purposes, all of the vessels involved MUST notify MSD Unalaska and the Port of Dutch Harbor prior to conducting any maintenance. The vessel with full maneuverability will assume full responsibility for the disabled vessel while alongside.

Summary: By documenting and enforcing prudent marine practices suitable for the geography and often-severe climate of the Port, marine casualties such as the Kuroshima and Hekifu can be avoided. These measures are not meant to cause unnecessary delays, or costs to ship owners and their agents. The intent of this plan is to ensure that vessels have the necessary equipment and knowledge suitable to anchor in the area, and to mitigate any potential hazardous weather conditions before the conditions deteriorate to the point that moving the vessel is no longer possible or the pilot is endangered trying to board. Ships will often delay departure, or will not call for a pilot until weather conditions force them to stop their current loading operations. By that time, attempting a departure has placed the vessel in extremis and will place the pilot in danger if he/she is needed to guide the vessel to safety. The Port of Dutch Harbor Severe Storm Plan is intended to safeguard the Port, City of Unalaska, vessel crews, and the environment from marine casualty and the potential pollution resulting from vessel groundings.

RECOMMENDED ROUTING MEASURES

Designating areas to be avoided near sensitive or hazardous shoreline and preferred passes for use in international transit assist to prevent a vessel that loses propulsion or steering from drifting onto shore before a rescue can take place. Vessel monitoring by Automated Identification System (AIS) will facilitate the prompt detection of a vessel deviating from these routes or seeming to drift or otherwise be in danger.

On December 4, 2014, the USCG submitted a proposal to the International Maritime Organization Sub-Committee on Navigation, Communication and Search and Rescue. The proposal aims to establish five recommendatory areas to be avoided (ATBAs) in the region of the Alaska Aleutian Islands for vessels making transoceanic voyages through the Bering Sea and North Pacific Ocean adjacent to the islands. In most areas, the proposed ATBAs extend no further than 50 nautical miles from the shoreline of the islands, with a few areas of greater distance. The 50 nautical mile buffer allows time for repair or time to launch an emergency response effort to a foundering vessel before it runs aground and damages sensitive resources. It will also reduce the possibility of ships grounding on the shoreline due to negligent navigation. Course alternations due to the establishment of the ATBAs will be minimal. The proposed ATBAs will allow ships to follow existing traffic patterns. The establishment of an ATBA will add approximately ten (10) nautical miles to an average overall transoceanic voyage.

FIGURE 2: PROPOSED ATBAS