U.S. Department of Homeland Security

United States Coast Guard

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United States Coast Guard

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OCT 24 2011

INVESTIGATION INTO THE CIRCUMSTANCES SURROUNDING THE PARASAILING ACCIDENT ON THE TIED HIGH 0.5 MILES OFF THE COAST OF OCEAN ISLE BEACH, NORTH CAROLINA ON AUGUST 28, 2009 WITH MULTIPLE LOSS OF LIFE

ACTION BY THE COMMANDANT

The record and the report of the Formal Investigation convened to investigate the subject casualty have been reviewed. The record and the report, including the findings of fact, analysis, conclusions, and recommendations are approved subject to the following comments.

As preface to the specific comments below, it is understood that the investigation highlighted many opportunities to advance small passenger vessel parasail safety but those actions are beyond my current authorities. However; I will work with the Area Commanders and publish policy guidance for Sector Commanders on measures they can enact under existing statutory authorities to improve safety in the parasail industry. Additionally, a Safety Alert has been issued to share lessons-learned with parasail operators in an effort to improve the overall safety performance of their operations.

ACTION ON RECOMMENDATIONS

Recommendation 1: It is recommended that the Commandant of the Coast Guard, in consultation with national parasailing organizations and/or the parasailing industry, establish distinct license, training, qualification, and experience requirements that apply to operators and crew of commercial parasail vessels.

Action: We partially concur with this recommendation. Presently, the Coast Guard lacks regulatory authority to compel compliance with regard to parasailing operations or equipment. Additionally, we determined that current marine inspection law would only permit promulgating such regulations for Coast Guard inspected small passenger vessels. New legislation would be required prior to promulgating any regulation pertaining to parasailing operations for the uninspected passenger vessels which comprise the majority of all parasailing vessels. While we do not agree that the Coast Guard should seek the legislative and regulatory authority to establish a distinct license to operate commercial parasailing vessels, we do agree that establishing minimum training and experience standards for operators and crew of parasailing vessels would increase parasailing safety and that the Coast Guard should work with parasailing organizations to establish industry standards. In May 2011, we approached the American Society for Testing and Materials (ASTM) and industry groups and proposed the development of a voluntary consensus standard. ASTM held an initial meeting and the industry participants agreed that such a standard was needed. We will continue to be engaged in that process. Additionally, we will form an internal working group to more closely explore legislative, regulatory, and policy

options and will promulgate and issue a safety alert announcing and detailing the steps necessary to execute these actions.

Recommendation 2: It is recommended that the Commandant of the Coast Guard require owners and operators of commercial parasail vessels to conduct a written assessment of all the risks it foresees could arise in conducting parasailing, and to prepare a written contingency plan approved by the local OCMI for eliminating, minimizing or responding to the risks.

Recommendation 3: It is recommended that the Commandant of the Coast Guard require owners and operators of commercial parasail vessels to conduct sufficient training, drills and exercises to ensure that crewmembers are proficient in parasailing emergency techniques and procedures. Training, drills and exercises shall be logged or otherwise documented for review by the Coast Guard upon request. Drills and exercises must test the proficiency of company and vessel personnel in assigned emergency response duties.

Recommendation 4: It is recommended that the Commandant of the Coast Guard require parasail vessels to have emergency instructions onboard and readily available to the master and crew to include at least the following parasailing contingencies: unintended landing on water; winch malfunction; towline failure; and propulsion machinery failure with a passenger in flight.

Recommendation 6: It is recommended that the Commandant of the Coast Guard require the operator of a commercial parasail vessel to record for each flight: the parasail canopy used and its operational limitations; the estimated weight of the passenger(s); the prevailing wind and sea state; the duration of the flight; and the details of any parasailing incident that occurred during the flight. The master of the parasailing vessel should be responsible for keeping these records and reporting the same to management. For each towline, the records should be kept for the duration of its service life and should be made available for review by the Coast Guard upon request.

Recommendation 10: It is recommended that the Commandant of the Coast Guard require owners and operators of commercial parasail vessels to provide a comprehensive passenger safety briefing prior to departure to include a discussion of the inherent risks of parasailing, the route and operational limits imposed to mitigate these risks, and the proper procedures to be followed during the course a parasailing emergencies to include: unintended landing on water; winch malfunction; towline failure; and propulsion machinery failure with a passenger in flight.

Action on Recommendations 2, 3, 4, 6, and 10: We concur with the intent of these recommendations. We encourage development of industry consensus standards for owners and operators such as risk assessments and contingency plans, training, drills, and exercises to include unintended water landings, winch malfunctions, towline failure, and propulsion machinery failure with a passenger in flight. We also encourage consensus standards for trip specific vessel logs and records in order to evaluate trends for the overall improvement of parasail safety. Such issues will be addressed in the ongoing ASTM and industry initiative also described in response to recommendation 1.

Recommendation 5: It is recommended that the Commandant of the Coast Guard, in consultation with national parasailing organizations and/or the parasailing industry, develop parasail towline selection, inspection and retirement (removal from service) guidelines. These guidelines should require records to be kept that indicate the size, fiber, construction, length, manufacturer, minimum breaking strength, safe working load, date placed in service, and inspection interval for each towline. Inspections should be logged and should check for damage, wear and include caliper measurements of the towline diameter to determine if the towline has deteriorated. The master of the parasailing vessel should be responsible for keeping these records and reporting the same to management. For each towline, the records should be kept for the duration of its service life and should be made available for review by the Coast Guard upon request. When developing the guidelines, the Coast Guard should further evaluate: the need to conduct additional operational tests to determine a towline's required minimum breaking strength; the need to require the breaking strength of each towline to be certified by the manufacturer by subjecting a portion of the rope to destructive testing prior to its installation; and the need to specify the use of more efficient connections (e.g., eye splices, thimbles, etc.) between the towline and the yoke.

Recommendation 7: It is recommended that the Commandant of the Coast Guard, in consultation with national parasailing organizations and/or the parasailing industry, develop operational readiness, maintenance, and inspection requirements for winches used to deploy and recover passengers while parasailing. When developing the inspection requirements, the Coast Guard should develop minimum power ratings and further evaluate the need for redundant or emergency winch systems that could be used should the primary winch fail.

Recommendation 9: It is recommended that the Commandant of the Coast Guard, in consultation with national parasailing organizations and/or the parasailing industry, define the necessary route and operational limits for safe parasailing, and direct cognizant Officers in Charge, Marine Inspection, to record these route and operational limits on the Certificate of Inspection of commercial parasail vessels.

Action on Recommendations 5, 7, and 9: We concur with the intent of these recommendations. In addition to the parasail operation standards previously mentioned, we also encourage the development of industry consensus standards for parasail towline design and inspection standards, operational readiness, maintenance, and inspection requirements for winches, and the establishment of routes and operational limits to improve parasail safety. Though there were no casual factors associated with the winch in this casualty, as stated before with regard to general marine safety, such issues should and will be addressed in the current ASTM and industry initiative also described in response to recommendation 1. Regarding routes and operational limits, in this case, local Regulated Navigation Areas might be appropriate if it can be enforced on all commercial parasail vessels.

Recommendation 8: It is recommended that the Commandant of the Coast Guard require the inspection of the parasail gear and equipment, as necessary to determine that the gear and equipment are in good working order and fit for the service intended, before the issuance of a Certificate of Inspection to any vessel that engages in commercial parasailing.

Recommendation 12: It is recommended that the Commandant of the Coast Guard, in consultation with national parasailing organizations and/or the parasailing industry, review, modify, and ultimately adopt and incorporate by reference in 46 C.F.R. Subchapter T, the Professional Association of Parasail Operators Operating Standards and Guidelines, or a similarly produced and recognized industry standard. Where industry has not established suitable safety requirements addressing the causes of this casualty, the Coast Guard should provide the leadership and catalyze their development. These actions will allow the Coast Guard to capitalize on standards that are already familiar to the parasailing industry and will raise the level of safety provided to the level expected by the American public. Further, it will minimize the burdens on the parasailing industry associated with variations in safety standards imposed by various jurisdictions.

Recommendation 13: It is recommended that the Commandant of the Coast Guard seek legislative authority to inspect parasail vessels that carry at least one passenger for hire and enact implementing regulations. This action when taken in concert with this report's other recommended actions will result in a regulatory regime that provides a set of minimum safety standards for commercial parasailing on U.S. navigable waters, and will result in lives saved.

Action on Recommendations 8, 12, and 13: We concur with the intent of these recommendations. However, we believe a voluntary consensus standard initiative of ASTM and industry stakeholders will provide the industry an opportunity to improve safety without additional Federal Regulation and should be provided an opportunity for implementation and evaluation. We will pass these recommendations to the ASTM standards working group for its consideration. In the meantime, we are forming an internal working group to more closely explore current legislative, regulatory, and policy options and will promulgate and issue a safety alert announcing and detailing the steps necessary to execute these actions.

Recommendation 11: It is recommended that the Commandant of the Coast Guard require commercial parasail operators to monitor marine broadcasts prior to conducting and while engaged in parasailing, and to obtain and monitor wind speed and direction in order to evaluate the advisability of launching passenger(s) in flight, or continuing with a flight when conditions progressively deteriorate.

Action: We concur with the intent of this recommendation. This is considered good marine practice and it is already required by 46 CFR 185.304 for all small passenger vessels, however the regulation does not apply to uninspected passenger vessels nor is it intended specifically to make decisions pertaining to parasailing operations. We will raise this issue to the ASTM standards working group for consideration with respect to parasailing operational parameters.

Recommendation 14: It is recommended that the Commandant of the Coast Guard provide written guidance to marine inspectors to be used during the inspection and certification of commercial parasail vessels. This guidance should be taught at the Marine Inspection and Investigation School at Training Center Yorktown and be made available to the public and parasailing industry.

Action: We partially concur with this recommendation. We are forming an internal working group to more closely explore current legislative, regulatory, and policy options and will promulgate and issue a safety alert announcing and detailing the steps necessary to execute these actions. In addition, the voluntary consensus standard initiative of ASTM and industry stakeholders will provide the industry an opportunity to improve safety without additional Federal Regulation and should be given an opportunity to be implemented and evaluated.

Recommendation 15: It is recommended that the Commandant of the Coast Guard provide written guidance to marine investigators to be used during the investigation of parasailing marine casualties. This guidance should be taught at the Marine Inspection and Investigation School at Training Center Yorktown and be made available to the public and parasailing industry.

Action: We partially concur with this recommendation. We agree that written guidance to marine investigators for use during the investigation of parasailing marine casualties would be helpful and we will evaluate the best method to achieve this purpose.

Recommendation 16: It is recommended that the Commandant of the Coast Guard provide notice to the parasailing industry that failures of parasailing equipment to include the winch, towline, harness, and parasail, are considered to be occurrences that materially and adversely affect a vessel's fitness for service, and are considered reportable marine casualties under 46 USC §6101 and its implementing regulations of 46 C.F.R. §§ 4.05-1(a)(4) and 185.202(a)(4).

Action: We do not concur with this recommendation. Parasailing vessels are certificated for service as small passenger vessels. We do not evaluate or certify a vessel's fitness for parasailing operations. Failures of equipment specific to parasailing do not affect the vessel's fitness for service as a small passenger vessel and therefore should not be considered to meet the criteria necessary to be considered a reportable marine casualty.

Recommendation 17: It is recommended that the Commandant of the Coast Guard implement the Voluntary Commercial Parasailing Vessel Safety Examination program instituted by Coast Guard Sector St. Petersburg throughout the Coast Guard until this report's other recommended actions can be fully enacted. This interim measure will enhance, improve, and increase Coast Guard interactions with the parasailing vessel industry and promote the voluntary compliance with industry best practices.

Action: We concur with the intent of this recommendation. We are forming an internal working group to more closely explore current legislative, regulatory, and policy options and will promulgate and issue a safety alert announcing and detailing the steps necessary to execute these actions. In addition, the voluntary consensus standard initiative with ASTM remains a viable near term option. This standard will be scientifically developed with input from any industry stakeholder wishing to participate and can be endorsed by the Coast Guard as a nationally recognized standard.

Recommendation 18: It is recommended that the Commandant of the Coast Guard provide a copy of this report to the following entities:

a. Area, district, and sector commanders;
b. Estates of the deceased;
c. Parties in interest;
d. Professional Association of Parasail Operators;
e. Parasail Safety Council;
f. Passenger Vessel Association;
g. Water Sports Industry Association;
h. Yale Cordage, Inc.;
i. North Carolina Wildlife Resources Commission;
j. Mayor, City of Wilmington, NC; and
k. Mayor, City of Ocean Isle Beach, NC
l. The National Transportation Safety Board

Action: We concur with this recommendation. We will provide a copy of this report to the listed entities as well as the next of kin.

[redacted]

JAMES A. WATSON
Rear Admiral, U.S. Coast Guard
Director of Prevention Policy

U.S. Department of Homeland Security

United States Coast Guard

Commander
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Fifth District

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NOV 23 2010

MEMORANDUM [redacted]

From: W. D. Lee, RDML
CGD FIVE (d)

Reply to Attn of: dp
CAPT D. Haynes
(757) 398-6691

To: COMDT (CG-545)

Subj: TIED HIGH PARASAILING ACCIDENT AND SUBSEQUENT LOSS OF TWO LIVES INVESTIGATION

Ref: (a) Title 46 United States Code, Chapter 63
(b) 46 Code of Federal Regulations, Part 4
(c) COMDINST M160000.10 Volume V

1. In accordance with the above references, LT [redacted] was designated to conduct a one man formal investigation into the TIED HIGH parasailing accident and subsequent loss of two lives, which occurred on August 28, 2009. The Report of Investigation (ROI) is attached. A public hearing was convened, witnesses were interviewed, and physical evidence was analyzed.

2. I have reviewed and concur with the findings of fact and analysis and wholeheartedly concur with the conclusions and recommendations.

3. No enforcement actions have been taken at this time. I am forwarding this case to the U.S. Attorney General for review for possible criminal liability of the company owner and master of the TIED HIGH under 18 U.S. C. § 1115, 46 U.S.C. § 2302(a), and other laws, as per 46 C.F.R. § 4.23-1. I will direct Sector Delaware Bay, which exercises OCMI authority closest to Captain [redacted] home of record, to initiate administrative suspension and revocation actions against the license of the master of the TIED HIGH for misconduct and negligence under 46 U.S.C. § 7703(1).

4. LT [redacted] LCDR [redacted], and the entire investigative team are commended for their thoroughness and resourcefulness demonstrated during this investigation. Please contact Captain David C. Haynes, Chief of Prevention, at 757-398-6691, if you have any questions or need further information.

#

Enclosure

Copy: CG SECTOR North Carolina
CG SECTOR Delaware Bay

U.S. Department of Homeland Security
United States Coast Guard

Commander
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Fifth Coast Guard District

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16732
18 November 2010

MEMORANDUM

[redacted]

From: [redacted] LT
Investigating Officer

Reply to Attn of: CGD Five (dpi)
LT [redacted]

To: W. D. Lee, RDML

Thru: CGD FIVE (dp)
CGD FIVE (dcs)

Subj: TIED HIGH PARASAILING ACCIDENT AND SUBSEQUENT LOSS OF TWO LIVES INVESTIGATION

Ref: (a) Letter of Designation as Investigating Officer dated August 31, 2009
(b) Title 46 United States Code, Chapter 63
(c) Title 46 Code of Federal Regulation, Part 4
(d) COMDINST M16000.1 Volume V

Preliminary Statement

In accordance with reference (a), you designated and directed me to conduct a formal investigation into the parasail casualty and subsequent loss of life of two passengers aboard the small passenger vessel TIED HIGH that occurred on August 28, 2009. LT [redacted] from Coast Guard Sector North Carolina was assigned as the recorder for the investigation. In accordance with reference (b), and with the investigative assistance of LT [redacted] from Training Center Yorktown, LCDR [redacted], MST2 [redacted] from Marine Safety Unit Wilmington, and Mr. [redacted] from the National Transportation Safety Board (NTSB), and with legal assistance provided by LCDR [redacted] from the Fifth Coast Guard District, a public hearing was held, numerous interviews were conducted, and equipment manufacture representatives were consulted. In accordance with reference (c), we were able to gather facts, conduct analysis, draw conclusions and make recommendations regarding this marine casualty. All evidence, correspondence and testimony gathered during the investigation and used to create this report are included in the Coast Guard's Marine Information System for Law Enforcement (MISLE) electronic database under Incident Investigation Activity Number 3579748.

Executive Summary

At approximately 1300 on August 28, 2009, with a small craft advisory in effect and a severe weather system 24 miles east of its position and moving west at 35 mph, the Coast Guard inspected small passenger vessel TIED HIGH departed from its dock in Ocean Isle Beach, NC,

with 12 passengers (eight adults and four minors) and two crewmembers aboard to go parasailing. At the time of the vessel's departure, the skies were overcast, winds were out of the northeast at 12 to 17 mph, seas were two to four feet, the air temperature was 84 degrees Fahrenheit, and the water temperature was in the middle 80s. The master proceeded to the Atlantic Ocean through the Shallotte Inlet at approximately 23 mph in a light rain. After transiting for about 20 minutes, the vessel arrived at the parasailing area located approximately two miles east of the Ocean Isle Beach Fishing Pier and approximately a half-mile offshore Ocean Isle Beach. It had stopped raining by the time the vessel arrived at its desired parasailing location.

With the vessel on location, the deckhand assisted the master and put the first two passengers in tandem flight. The master reeled out approximately 800 feet of parasail towline and the passengers remained in flight for a total of 15 minutes. They were recovered safely and the next two passengers were prepped by the deckhand and put into tandem flight minutes later. The master reeled out approximately 500 feet of parasail towline when the winds increased to 19 to 25 mph as a thunderstorm approached the parasailing area. In response to the apparent weather, the master attempted to recover the two passengers. The master reeled in approximately 250 feet of parasail towline before the winch's capacity was overcome by the parasail[1] load due to strong winds, and the parasail began towing the vessel astern. With the vessel's forward movement lost, the master tried turning the vessel toward the stranded passengers in flight in an attempt to relieve the tension in the towline and then perform another attempt to retrieve the passengers using the winch. However, the master quickly abandoned the turn when he felt that the tension on the towline threatened to capsize the vessel. The master then steadied the vessel back into the wind and continued working the winch with no success.

As the situation deteriorated and still unable to retrieve the passengers with the winch, the master instructed the deckhand to drop the anchor. The anchor held but the two passengers remained aloft approximately 250 feet behind and above the vessel. During this time, winds ranged from 23 to 34 mph with gusts to 40 mph and seas were choppy with four to six feet swells with an occasional eight-foot crest. Recognizing his precarious situation, and with the vessel and parasail in extremis, the master called the vessel's owner on his cell phone and requested immediate assistance. The master intended to hold the vessel at anchor so as not to be dragged further backwards. He also made additional attempts to retrieve the stranded passengers using the winch while waiting for assistance from the owner. However, before the owner could arrive on scene with another support vessel, the parasail towline parted and the two passengers rapidly descended to the ocean surface and were quickly carried away from the vessel. Upon entering the water, and due to strong winds and the still inflated canopy, the two passengers were violently dragged backwards along the water's surface and through the waves.

The master ordered the deckhand to cut the anchor line and then maneuvered the vessel in pursuit of the two passengers. As the vessel approached the now unattached parasail, the plan was for the deckhand to deflate the canopy by jumping off the vessel and onto the canopy, but he was unsuccessful. Instead of recovering the deckhand from the water, the master decided to leave him behind to conduct a second rescue attempt solo. In the second attempt, the master again maneuvered the vessel into the path of the drifting parasail, but this resulted in the two

[1] Unless otherwise stated in this report the terms parasail and canopy are interchangeable and address the same piece of equipment. These terms are also used interchangeably in the parasail industry.

harnessed passengers colliding with the vessel, becoming briefly entangled in the aluminum superstructure, before being propelled back into the air by the inflated canopy. For the third rescue attempt, the master decided to first recover his deckhand before attempting the same procedure as in the first rescue attempt. In this third attempt, the deckhand successfully grabbed the parasail harness and was able to cut the shroud cords and deflate the canopy. The deckhand held onto the passengers and was able to guide them closer to shore where they could be recovered.

To secure the vessel, the master intentionally grounded the vessel approximately 50 yards east of the Ocean Isle Beach Fishing Pier. Ocean Isle Beach Fire and EMS first responders rescued the deckhand and recovered the two passengers and began CPR, but the passengers were non responsive and were pronounced dead on arrival.

The uninjured passengers required no medical attention or treatment. The vessel and the environment did not sustain any damage as a result of the intentional beaching. The next day, the vessel was placed on a trailer and removed from Ocean Isle Beach.

The medical examiner's report revealed that both victims sustained severe blunt trauma to the head and body. Neither the medical examiner's report nor this investigation determined exactly what caused the specific trauma that led to their deaths—whether it was the violent dragging along the ocean surface, the impact with the vessel during one of the rescue attempts, or both.

The constructed timeline (*approximate times*) of the incident is as follows:

Time	Event
1300	TIED HIGH departed Ocean Isle Beach, NC, en route to parasailing area.
1320	TIED HIGH arrives at parasailing area approximately 2 miles east of the Ocean Isle Beach Fishing Pier.
1325	First two passengers were put into tandem flight and recovered safely.
1340	Second two passengers (victims: Cynthia C. Woodcock and Lorrie D. Shoup) were put into tandem flight.
1342	Second two passengers (victims) became stranded aloft.
1342-1345	Passenger ([redacted] made multiple calls to company/vessel owner to report situation.
1350	First 911 call was made by a witness on the beach reporting the situation.
1351	Parasail towline parted. Parasail descends rapidly toward the ocean surface and drifts away from the vessel.
1351-1400	Victims are violently dragged backwards along the ocean surface. Three rescue attempts were made by the master and deckhand. The third attempt was successful.
1359	Local Fire and EMS arrived on scene at the Ocean Isle Beach pier.
1401-1406	Local Fire and EMS pulled the deckhand and victims ashore. EMS administered CPR on victims but victims were unresponsive.
1407	EMS declared both victims DOA

Vessel Data

Name:	TIED HIGH
Flag:	United States
Official Number:	1195615
Service:	Passenger (Inspected)
Vessel Type:	Parasailing
Builder:	Commercial Water Sports, Inc.
Place Built:	Clermont, NJ
Hull Material:	Fiberglass Reinforced Plastic
Gross Registered Tons:	13
Length:	31 feet
Breadth:	10 feet 6 inches
Maximum Draft:	2 feet ½ inch
Propulsion:	Single Diesel Outdrive
Horsepower:	310
Maximum Speed	30 mph (full load calm waters)
Inspection Subchapter:	46 C.F.R. Subchapter T
Date Keel Laid:	September 22, 2006
Certification Date:	April 10, 2007
Expiration Date:	April 10, 2012
Manning:	1 Master, 1 Deckhand
Passengers:	No more than 12
Route:	Lakes, Bays, and Sounds plus Limited Coastwise no more than three (3) miles offshore
Hailing Port:	Ocean Isle Beach, NC
Owner:	Ocean Isle Beach Watersports, Inc.
Operator:	North Carolina Watersports, Inc.

Personnel Data

Vessel Crew	Age	Position	Sea Time	Time Aboard TIED HIGH
[redacted]	[redacted]	Master	7 years	Two Parasailing Seasons May – September 2008 May – August 2009
[redacted]	[redacted]	Deckhand	2 years	Two Parasailing Seasons May – September 2008 May – August 2009

Deceased Passengers	Age	Next of Kin (Relationship)
Lorrie D. Shoup	[redacted]	[redacted] (Husband)
Cynthia C. Woodcock	[redacted]	[redacted] (Husband)

Parties in Interest	Role	Counsel
[redacted]	Master of the TIED HIGH	[redacted] Esq.
[redacted]	Deckhand of the TIED HIGH	[redacted] Esq.
[redacted]	Owner of the TIED HIGH, Ocean Isle Beach Watersports, Inc., and North Carolina Watersports, Inc.	[redacted] Esq.

Findings of Fact

Parasailing:

1. Parasailing is generally understood to mean the towing of one or more passengers by a vessel when the passenger(s) are tethered to the vessel, ascend above the water with the aid of a parasail, and remain suspended above the water while the vessel is underway.

2. There are currently no federal regulations that regulate a commercial parasail vessel's winch, towline and associated parasail equipment, or the parasail operation itself.

3. This investigation did not find any applicable State or local regulations within the State of North Carolina that focus on a commercial parasail vessel's winch, towline and associated parasail equipment, or the parasail operation itself.

4. The Professional Association of Parasail Operators (PAPO) has developed and published parasail Operating Standards and Guidelines (OSAG) for safe parasail operations. All PAPO members, as a condition of membership, among other things, must adhere to the OSAG while conducting commercial parasail operations. These guidelines are available to PAPO members, the parasail industry, and the public.

5. The Coast Guard does not officially endorse PAPO or its OSAG; however, the organization and its standards and guidelines have been referenced in unit level literature as a best practice.

6. The government of Queensland, Australia instituted a standard applicable to parasailing from a commercial vessel under their Transport Operations (Marine Safety) Act 1994. The standard, referred to as Transport Operations (Marine Safety – Parasailing) Standard 2007, became effective on June 15, 2007, and includes requirements for the parasail vessel's winch, towline and associated parasail equipment, and the parasail operation itself.

Incident Narrative:

7. At about 1300 on August 28, 2009, with a small craft advisory in effect and a severe weather system 24 miles east of its position and moving west at 35 mph, the TIED HIGH departed from its dock in Ocean Isle Beach, NC, with 12 passengers (eight adults and four minors) and two crewmembers aboard to go parasailing.[2] At the vessel's time of departure, the skies were overcast, winds were out of the northeast at 12 to 17 mph, seas were two to four feet, the air temperature was 84 degrees Fahrenheit, and the water temperature was in the mid 80s. Shortly after the vessel's departure, it began to lightly rain. The master proceeded to the Atlantic Ocean through the Shallotte Inlet at a speed of approximately 23 mph. After a 20 minute transit, the vessel arrived at the parasailing area, approximately two miles east of the Ocean Isle Beach Fishing Pier and a half-mile offshore Ocean Isle Beach. By this time it had stopped raining.

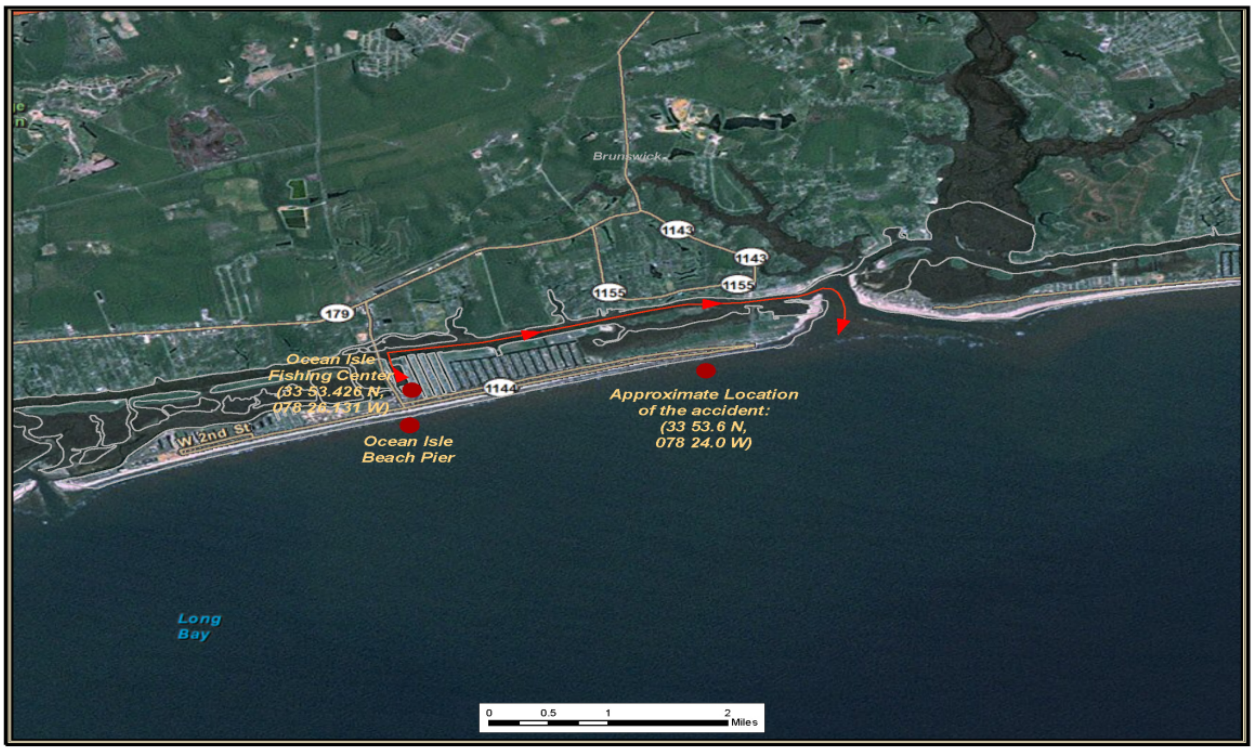

Figure 1. Map of the operating area

[2] At 35 mph the storm can travel the 24 miles from its location to the TIED HIGH parasailing area in about 41 minutes.

8. At 1301, the National Weather Service (NWS) Wilmington issued a Special Weather Statement[3] on 162.550 megahertz (i.e. NOAA Weather Channel 1) that stated the following:

> *"At 1258 PM EDT…showers and thunderstorms were producing heavy rain…along a line extending from 7 miles southeast of Topsail Beach to 6 miles south of Southport…moving west at 35 mph. These thunderstorms will produce heavy rainfall of up to three-quarters of an inch. Brief wind gusts to 30 mph are possible."*

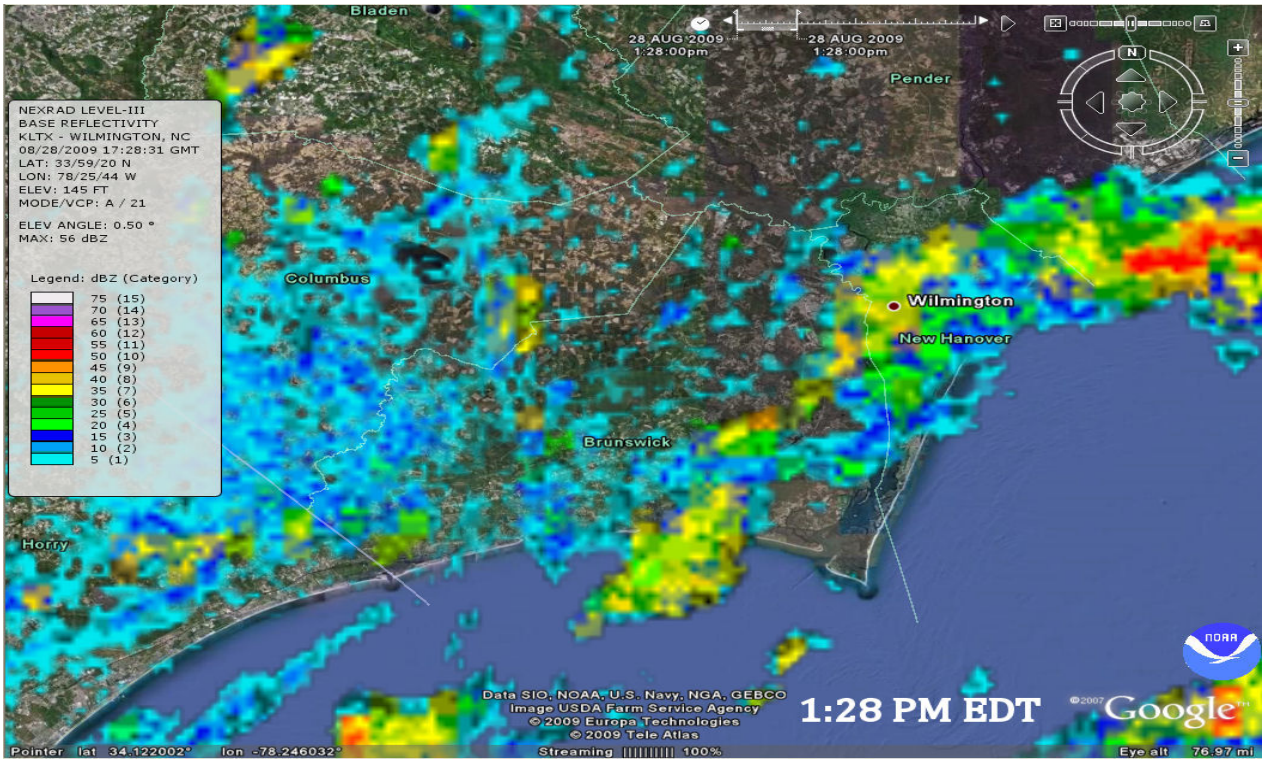

Figure 2. National Weather Service Radar Image, August 28, 2009

9. At about 1325 and with the vessel on location, the master, [redacted] put the first two passengers, [redacted] and his daughter, [redacted] in tandem flight. The master reeled out 800 feet of towline, allowed the passengers to remain in flight for several minutes, and then safely recovered the passengers. The entire evolution lasted approximately 15 minutes.

10. At about 1340, the master put the second set of passengers, Cynthia C. Woodcock and Lorrie D. Shoup, in tandem flight and reeled out about 500 feet of towline. However, due to the approaching storm, the wind speed increased from 12 to 17 mph to 19 to 25 mph. This change in weather conditions prompted the master to terminate the planned 15 minute tandem flight and decided to retrieve the two passengers.

[3] A Special Weather Statement is designed to alert customers to a short-term hazardous weather threat, occurring within six hours of product issuance, which may require a heightened level of awareness or action. The Special Weather Statement remained in effect until 1430, Friday, August 28.

Figure 3. Picture of Cynthia C. Woodcock and Lorrie D. Shoup being prepped for tandem flight

11. As the master retrieved the two passengers, he used the winch intermittently fearing it would overheat under the load. With about 250 feet of towline recovered, and with the wind now in excess of 25 mph, the load became too much for the winch and further retrieval was made impossible. Simultaneously, due the high wind, the vessel lost its forward way and the parasail began pulling the vessel astern.

12. At 1342, sensing the TIED HIGH and its occupants were in extremis, passenger [redacted] attempted to call the vessel owner, [redacted] via her cellular phone, to report the emergency and to request help. Mrs. [redacted] mistakenly dialed the telephone number of the owner's brother, [redacted] The owner's brother received Mrs. [redacted] report and immediately conveyed the emergency message to the owner. Mrs. [redacted] dialed the owner's brother again at 1343, and again at 1345, with the intent to report the deteriorating situation, but the owner's brother did not answer.[4]

13. The owner called the master aboard the TIED HIGH via his cellular phone, but the master did not answer. During this time, the master was attempting to turn the TIED HIGH 180 degrees to port and head towards the parasail. This maneuver was intended to stop the TIED HIGH from being towed astern, reduce the wind resistance, and take some of the tension and load off the towline and winch. This maneuver may also have allowed for the retrieval of the passengers in flight. However, the master quickly abandoned the turn when the overturning moment (port list) created by the lateral force of the towline threatened to capsize the vessel. The master steadied the vessel back into the wind and continued working the winch with no success, and the vessel continued to be towed astern.

14. Still unable to retrieve the two passengers and still being towed astern, the master instructed the deckhand, [redacted] to drop the anchor. The anchor slipped initially, dug down,

[4] Mrs. [redacted] inadvertently dialed the telephone number of the owner's brother because her family rented jet skis from the owner's brother the previous day and his number was stored in her cell phone.

and then held. With backward way stopped, the master put the transmission in neutral, raised the revolutions per minute (RPMs) on the vessel's diesel engine to max power to increase power to the hydraulic winch in an attempt to better retrieve the two, now suspended passengers. However, despite the increase in the diesel engine's RPMs, the master was unable to successfully retrieve the passengers.

15. Recognizing he was unable to retrieve the passengers without outside assistance, the master decided to call the vessel's owner via his cellular phone, and prior to dialing, he noticed that he had missed the owner's phone call. The master called the owner back, reported his situation to the owner, and requested immediate assistance. In response, the owner told the master he would get out there as soon as possible.

16. At the time of the phone conversation between the owner and master, the owner was away from the Ocean Isle Beach Watersports' office running an errand. Upon concluding the call with the master, the owner called his brother and directed him to get the assist boats ready.[5] The owner told his brother to wait until he arrived at the docks to launch the boats.

17. While waiting for assistance, the master stated he opened the engine room hatch door to see if the winch was malfunctioning and to check the hydraulic lines for any leaks, but detected nothing out of the ordinary. He also paid out additional towline to see if the hydraulic fluid was circulating, and the system responded properly. During testimony, the master stated that after running these basic system checks, he was confident the winch was still in good working order but that its recovery capacity had been exceeded.

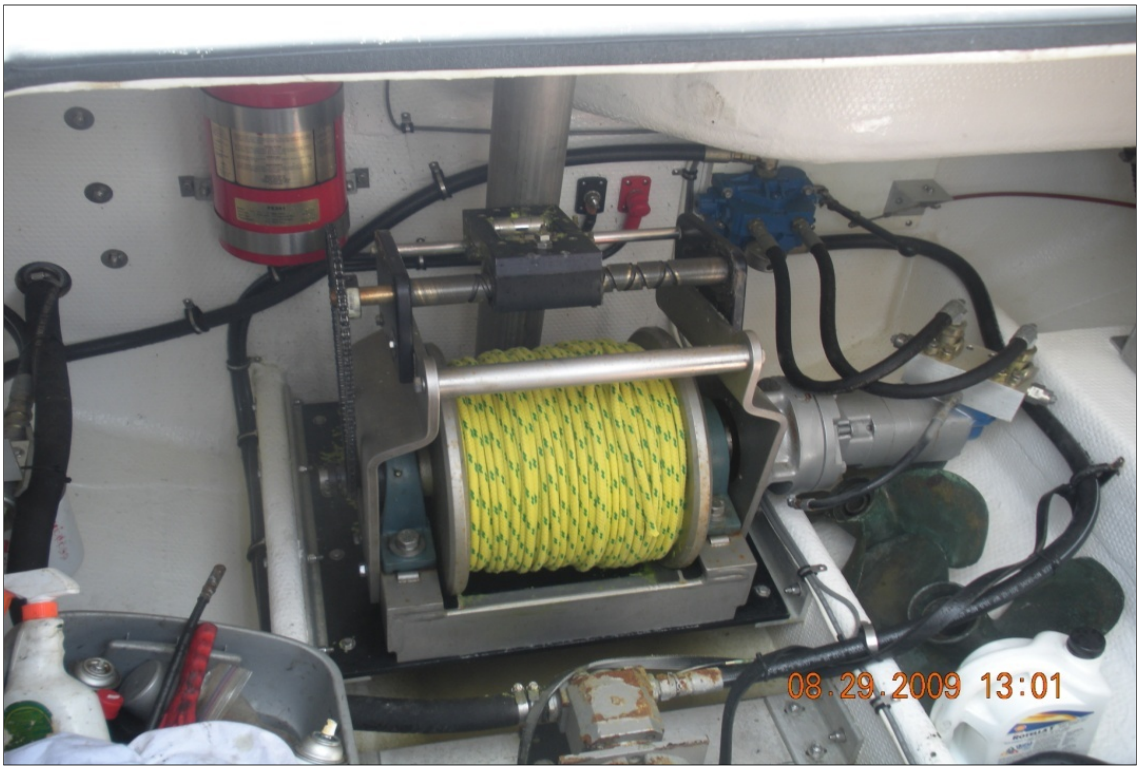

Figure 4. Picture of the winch, hydraulic system, hoses and towline onboard the TIED HIGH

[5] During testimony, the owner stated that he had four boats and crews that were available to assist the TIED HIGH.

Figure 5. Winch control lever onboard the TIED HIGH (closest to steering helm)

18. After completing basic hydraulic winch system checks, the master called the owner again to get an estimate as to when the owner and assist boats would be arriving on scene to render assistance, and to emphasize that the situation was dire. During the conversation at about 1351, the vessel's towline parted at the bowline knot and Mrs. Shoup and Mrs. Woodcock were carried away from the vessel as they descended upon the surface of the ocean. Upon entering the water, the still inflated parasail rapidly dragged the two passengers backward along the surface of the ocean. Winds at this time ranged from 23 to 34 mph with gusts upward to 40 mph. Seas were choppy with waves four to six feet high with an occasional eight-foot crest.


Figure 6. Witness photo of passengers being dragged across the water in heavy seas.

19. The master ordered the deckhand to cut the anchor line and the master then gave chase after the two passengers as they skipped along the ocean surface. As the vessel came alongside the two passengers, the master instructed the deckhand to jump from the bow of the vessel onto the parasail in an attempt to deflate it. The deckhand did as instructed but was unsuccessful and the two passengers continued to be dragged through the waves. The master left the deckhand in the water and continued to give chase.

20. On the second rescue attempt, the master passed the two passengers, went downwind and positioned the TIED HIGH perpendicular to and in way of the passengers' expected path. However, the two passengers collided with the side of the vessel and the parasail bridle and gear became entangled in the aluminum superstructure. The master grabbed hold of the passengers, but was forced to let them go moments later as the TIED HIGH rolled to port and again almost capsized due to the wind and inflated parasail.[6] The passengers cleared the vessel and continued their advance through the waves toward the Ocean Isle Beach Fishing Pier. The master went back to recover the deckhand and then gave chase after the two passengers again.

Figure 7. Witness photo of second rescue attempt just before the two passengers collided with the TIED HIGH

21. On the third rescue attempt, the deckhand was instructed by the master to once more jump from the bow of the TIED HIGH onto the parasail while traveling at the vessel's maximum speed in the choppy sea conditions. The deckhand jumped, successfully landed on the flight bar,

[6] During the hearing, the vessel master described the two passengers' impact with the TIED HIGH as a glancing blow. The passengers aboard the vessel said the two women struck the TIED HIGH with extreme force. However, the witnesses who testified at the hearing stated the women appeared to be dead or unconscious prior to the collision.

reached up with a knife, cut the shrouds and deflated the parasail. Now in the surf, the deckhand held onto the passengers and tried administering CPR.

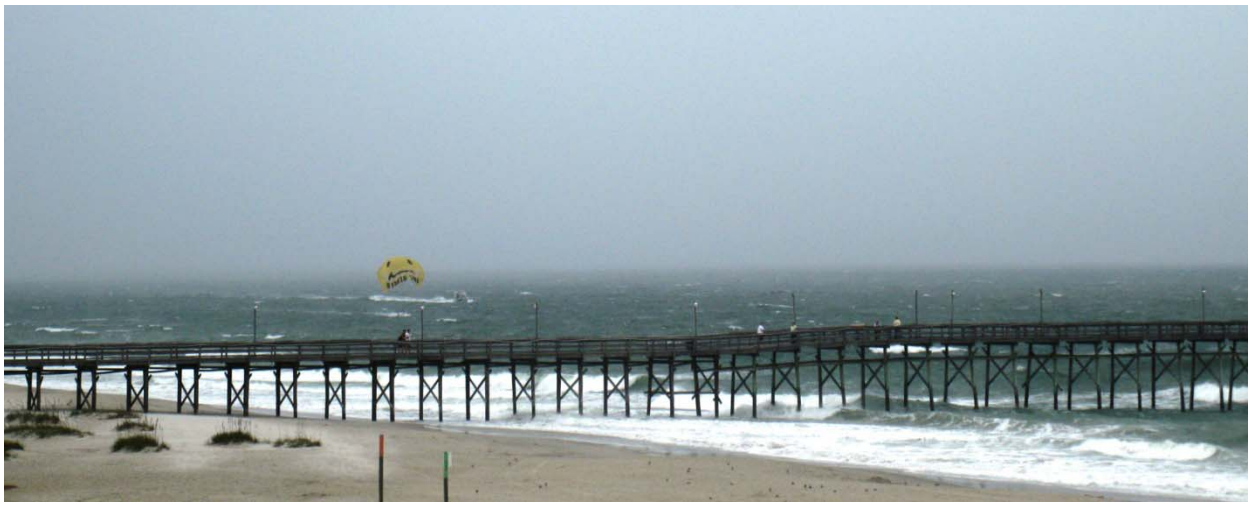

Figure 8. Witness photo 1 of the third rescue attempt. Ocean Isle Beach Fishing Pier in foreground.

Figure 9. Witness photo 2 of the third rescue attempt. Picture shows deckhand clinging to harness bar with several shroud cords having been cut.

Figure 10. Witness photo 3 of the third rescue attempt. Most of the shroud cords have been cut by the deckhand and the canopy is starting to deflate.

Figure 11. Witness photo 4 of the third rescue attempt. Deckhand recovers passengers and is adrift near the Ocean Isle Beach Fishing Pier.

22. The deckhand and recovered passengers drifted toward shore and washed through the Ocean Isle Beach Fishing Pier without making contact with any part of the pier pilings.

23. The master continued to monitor the rescue attempt, but with his attention focused on the deckhand he lost situational awareness and the vessel got caught in the surf. As a result, the

master intentionally grounded the vessel approximately 50 yards east of the Ocean Isle Beach Fishing Pier.

24. The master and Ocean Isle Beach first responders, who had been called by eye witnesses reporting the incident and who had arrived on scene, helped the passengers get off the vessel and onto the beach. There was no damage caused to the vessel or pollution as a result of the intentional beaching. Once grounded, the master left the vessel and the uninjured passengers and ran towards the deckhand to render assistance.

Figure 12. Picture of the TIED HIGH aground post incident

25. At about 1406, Ocean Isle Beach first responders pulled the two passengers ashore, relieved the deckhand and began administering CPR. Despite an attempt by the first responders, the two injured passengers were non responsive, thus, CPR was suspended and both passengers were pronounced deceased. The other passengers on the beach required no medical treatment.

26. On August 29, 2009, the vessel was placed on a trailer and removed from Ocean Isle Beach.

Vessel Description:

27. The TIED HIGH is a 31-foot, U.S. documented, Coast Guard inspected, small passenger vessel built in 2007 by Commercial Water Sports specifically for parasailing. The vessel is of Fiberglass Reinforced Plastic (FRP) construction and is equipped with a single Volvo Diesel engine model D6 capable of providing 310 horsepower. In calm seas, the vessel can obtain speeds of 30 mph in a full load condition (i.e., with a full load of crew, passengers, equipment and fuel). The vessel is outfitted with port and starboard fuel tanks with a total capacity of 74 gallons. The engine is located in an engine compartment below deck, just aft of the operating station along the centerline of the vessel. The vessel's winch, hydraulics and towline used for parasailing are also located in the engine compartment. The vessel's tow post is adjacent the operating station, centerline of the vessel, located just forward of the engine compartment hatch. Passenger seating arrangement is located forward of the operating station on the port and starboard side of the vessel. Passengers are put in flight and retrieved on the vessel's landing platform, which begins aft of the engine compartment hatch and continues to the stern.

Figure 13. Aft deck view of the TIED HIGH

Vessel Construction, Inspection, and Certification:

28. In Fall 2006, Commercial Water Sports, Inc., located in Clermont, NJ, began building the subject vessel for inventory and sale. During its construction, the vessel was purchased by Ocean Isle Beach Watersports, Inc., and named the TIED HIGH. Sector Delaware Bay provided regulatory oversight as the vessel was intended to serve as an inspected parasail vessel regulated under Title 46, Code of Federal Regulations (C.F.R.), Subchapter T–Small Passenger Vessels. In March 28, 2007, the Officer in Charge, Marine Inspection (OCMI) Sector Delaware Bay, issued a temporary Certificate of Inspection (COI) to the vessel.

29. Once construction was complete, the TIED HIGH was shipped to Wilmington, NC. There, the OCMI Cape Fear River[7] conducted a subsequent inspection for certification and issued a new COI on April 10, 2007. The COI authorized the vessel to carry 12 passengers and two crew on a Lakes, Bays, and Sounds plus Limited Coastwise route, not more than three miles offshore.

30. The Marine Safety Center (MSC) issued a stability letter to the vessel on April 17, 2007. The stability letter issued was based on the vessel's inclining experiment, performed on March 3, 2007, by a naval architect and Commercial Water Sports, Inc., and witnessed by a Coast Guard marine inspector from Sector Delaware Bay. Stability calculations were reviewed and approved by MSC. The stability letter authorized the TIED HIGH to carry a maximum of 14 persons (crew and passengers) on partially protected waters, but cautioned that the route may be further limited to that specified on the vessel's COI.[8] The letter required the master to exercise caution to minimize all negative impacts of stability due to parasailing operations.

[7] Marine Safety Unit (MSU) Wilmington is a subordinate unit to Sector North Carolina and is responsible for the Cape Fear River Marine Inspection Zone, which includes Wilmington and Ocean Isle, NC. (See 33 C.F.R. § 3.25-20).

[8] As defined in 46 C.F.R. § 170.050, partially protected waters is a term used in connection with stability criteria for all inspected vessels and means waters within 20 nautical miles of the mouth of a harbor of safe refuge, unless determined by the OCMI to be exposed water and those portions of rivers, harbors, lakes, etc. which the OCMI determines not to be sheltered.

31. Marine inspectors from MSU Wilmington conducted annual inspections on the TIED HIGH on April 2, 2008, and again on March 5, 2009, endorsing the COI on both occasions. The 2008 inspection resulted in zero deficiencies, while the 2009 inspection resulted in five deficiencies, which were corrected in a timely manner. During the course of these inspections, the marine inspectors visually examined the condition of the parasail winch system to ensure that its condition would not negatively affect the vessel's seaworthiness. Additional parasail equipment including the towline was not onboard the vessel and was not examined. At the time of this parasailing casualty, the TIED HIGH had a valid COI.

Crewmembers:

32. Mr. [redacted] is a 42-year old male and licensed merchant mariner.[9] Mr. [redacted] was the master of the TIED HIGH at the time of the casualty and had been working for North Carolina Watersports, Inc., since May 2008. Mr. [redacted] holds Coast Guard license number 1527076, issue number three. The license was issued on February 12, 2009, and expires on February 12, 2014.

33. Mr. [redacted] is a [redacted]-year old male and licensed merchant mariner. Mr. [redacted] was the deckhand on the TIED HIGH at the time of the casualty and had been working for North Carolina Watersports, Inc. since May 2008. Mr. [redacted] holds Coast Guard license booklet serial number [redacted], issue number two. The license was issued on June 25, 2009, and expires on June 25, 2014. Although Mr. [redacted] holds a license, no license was required in order to act as the deckhand aboard the TIED HIGH.

Owner:

34. Mr. [redacted] is a [redacted]-year old male and licensed merchant mariner. Mr. [redacted] is the owner of Ocean Isle Beach Watersports, Inc., which owns the TIED HIGH, and North Carolina Watersports, Inc., which operates the TIED HIGH through a lease agreement. Mr. [redacted] holds Coast Guard license booklet serial number 000050429, issue number three. Mr. [redacted] normally serves as master of the FLYING FISH, which is also a Coast Guard inspected small passenger vessel leased and operated by North Carolina Watersports, Inc., and serves as master of the TIED HIGH on occasion and during regularly scheduled Coast Guard inspections.

License Requirements:

35. 46 U.S.C. §§ 8902 and 8903 require licensed operators on inspected small passenger vessels and uninspected passenger vessels. These statutes and their implementing regulations do not specifically address commercial parasailing.

36. To operate the TIED HIGH on its authorized route, the mariner is required to have at a minimum, a Coast Guard license issued for master of vessels not more than 50 gross registered tons upon near coastal waters.

[9] Ages of individuals referenced in this report refer to the age of the individual on August 28, 2009.
[10] The license was renewed on March 3, 2010 and expires on March 3, 2015.

37. Pursuant to 46 C.F.R. §10.201 *et seq.*, in order to hold a Coast Guard license, a mariner must establish to the satisfaction of the Coast Guard that he or she possess all the qualifications necessary including but not limited to age, experience (sea service), character, physical health, citizenship, approved training, passage of a professional examination, a test for dangerous drugs, and when required, a practical demonstration of skills.

38. As authorized by 46 C.F.R. §11.211(a), for sea service on vessels under 200 gross registered tons, prospective masters may attest to their own service (i.e., sea-service can be demonstrated by means of self-generated trip or vessel logs). A mariner must present documentation of 360 days of sea time to obtain an Operator of an Uninspected Vessel (OUPV) license, of which 90 days must be on near coastal waters to receive a near coastal endorsement. The mariner must attend a sea school and present a certificate of completion to the Coast Guard Regional Exam Center (REC) to be issued an OUPV license.

39. In order to execute a raise in grade from an OUPV license to a 50 gross registered tons license upon Near Coastal Waters, a mariner is required to provide proof of an additional 360 days of sea time for a total of 720 days. The mariner needs a total of 360 days on a near coastal route to obtain a near coastal endorsement on a Master of not more than 50 gross registered tons license with at least 90 days of the service within the past three years on a vessel of the appropriate tonnage. Additionally, a mariner may attend a sea school, take an upgrade class and present a certificate of completion to the REC; or the mariner may take a full exam at the REC consisting of four modules: 0545 - Rules of the Road, 072 - Navigation General, 077 - Chart Work, and 221 - Deck General, Deck Safety & Environmental. Questions pertaining to weather and seamanship to include vessel handling are found in the Navigation General and Deck General modules of the license exam. A minimum score of 90% is required for module 0545 and a 70% or better for the other three modules for satisfactory completion.

40. The master of the TIED HIGH, Mr. [redacted] acquired the prerequisite sea-service time to obtain an OUPV license in 2002 from owning of a 24-foot cuddy cabin boat. He signed off on his sea time, and attended and passed a 12-day sea school in Panama City Beach, Florida. He obtained his OUPV license on July 22, 2002. The master executed a raise in grade in February 2009 after submitting to the local REC a sea school certificate of completion dated November 11, 2008, and a small vessel sea service form (signed by: self; [redacted] - M/V SKY PIRATE; [redacted] – M/V PARASAIL; and the president O.C. Parasail, Inc.). Mr. [redacted] received a master license of not more than 50 gross tons (domestic) upon North Carolina waters on February 12, 2009.

41. The deckhand of the TIED HIGH, Mr. [redacted] acquired the prerequisite sea-service time to obtain an OUPV license in 2008. He signed off on his sea time, and attended and passed a sea school in Wilmington, Delaware. He obtained his OUPV license June 9, 2008. The deckhand executed a raise in grade in June 2009 after submitting a sea school certificate of completion dated April 7, 2009, and a small vessel sea service form (signed by: self – M/V SOUTHERN HOOK, M/V SEA RAY SUNDECK; and [redacted] – M/V FLYING FISH) to the local REC. Mr. [redacted] received a master license of not more than 50 gross tons (domestic) upon North Carolina waters on June 25, 2009.

42. The owner, Mr. [redacted] acquired the prerequisite sea-service time to obtain an OUPV license on July 24, 2001. He executed a raise in grade and received a master license of not more

than 100 gross tons (domestic) upon North Carolina waters on February 25, 2005. There are no records or certificates on file at the National Maritime Center (NMC) to verify if Mr. [redacted] signed off on his sea time, attended and passed a sea school, took an upgrade class or took a full exam at a local REC to obtain his licenses.

Weather:

Forecasted

43. At 1557 on Thursday, August 27, 2009, less than 24 hours prior to the casualty, the NWS issued a coastal waters forecast for the waters from Surf City, NC, to south Santee River, SC, out to 20 nautical miles. The forecast stated Tropical Storm Danny was expected to continue organizing and would make its closest approach to the area Friday night and early Saturday morning. The storm was predicted to pass east of the area but swells associated with storm would affect the area through Saturday.

44. At 1736, the NWS forecast stated a Small Craft Advisory (SCA) would be in effect from 2300 Thursday evening through Saturday morning. Conditions for Friday were forecasted to include NE winds around 12 mph, increasing to 17 to 23 mph in the afternoon; seas six to seven feet in SE swell except seas four to five feet near shore; and scattered showers and thunderstorms mainly in the afternoon. The forecast cautioned that higher winds and seas should be expected in and near thunderstorms.

45. At 2142, the NWS forecast stated a SCA was in effect and that there was a slight chance of showers and thunderstorms overnight. The forecasted conditions for Friday were unchanged.

46. At 2345, the NWS forecast stated seas would be six to nine feet in SE swell and the seas four to five feet near shore would subside to three to four feet after midnight. Numerous showers and thunderstorms were expected for Friday, mainly in the evening.

47. At 0509 on Friday, August 28, the NWS issued a Coastal Hazard Message that stated there would be a high risk of rip currents through the evening. Long period SE swells in advance of Tropical Storm Danny would result in strong rip currents for the beaches. A life threatening surf zone was expected with breakers of four feet coupled with very strong rip currents.

48. At 0608, the NWS issued an Urgent – Marine Weather Message that stated a SCA remained in effect until 0800 on Saturday and that SE swells from Tropical Strom Danny would continue to affect the waters through Saturday with the worst swells occurring that day through the night. In addition, the message provided the following precautionary/preparedness actions:

> *"A small craft advisory means that seas of 6 feet or greater are expected to produce hazardous conditions to small craft. Inexperienced mariners, especially those operating smaller vessels, should avoid navigating in these conditions."*

49. At 0625, the NWS coastal waters forecast stated that for the rest of the day, conditions would include NE winds around 12 to 17 mph increasing to 17 to 23 mph late; seas around six feet in SE swell except seas around four feet near shore; and scattered showers and thunderstorms in the

morning and numerous showers and thunderstorms in the afternoon. The forecast cautioned that higher winds and seas should be expected in and near thunderstorms.

50. At 1007, the NWS forecast stated that for the rest of the day, conditions would include NE winds around 12 to 17 mph with gusts to 23 mph, increasing to 17 to 23 mph late; seas around six feet in SE swell except seas around four feet near shore; and scattered showers and thunderstorms late in the morning, then numerous in the afternoon. As before, the forecast cautioned that higher winds and seas should be expected in and near thunderstorms.

51. At 1207, about one hour before the TIED HIGH got underway, the NWS forecast stated that for the afternoon, conditions would include E winds 12 to 17 mph increasing to 17 to 23 mph late; seas around six feet in SE swell except seas around four feet near shore; and numerous showers and thunderstorms. As before, the forecast cautioned that higher winds and seas should be expected in and near thunderstorms.

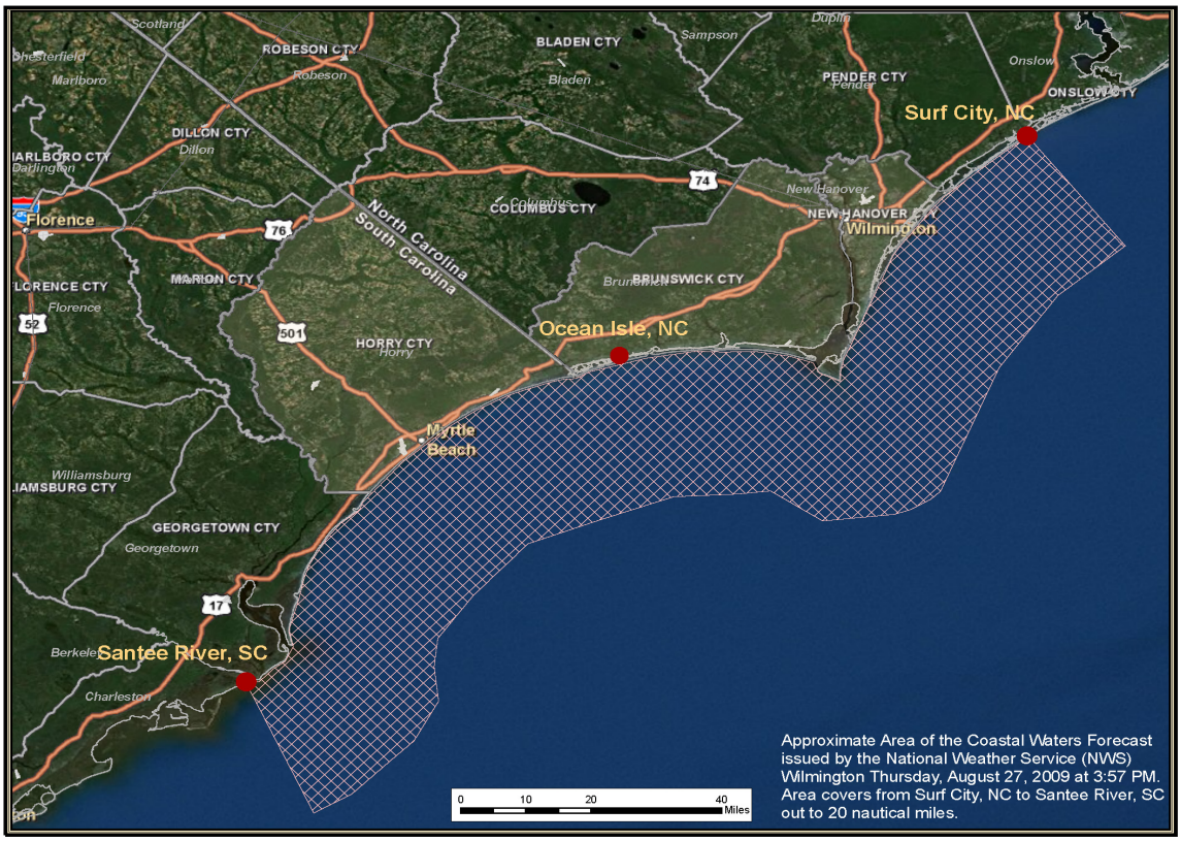

Figure 14. Map of geographic area under the weather advisory

Observed

52. At 1301, NWS issued a *Special Weather Statement* on 162.550 megahertz (i.e. NOAA weather channel one) that stated showers and thunderstorms were observed producing heavy rain along a line extending from seven miles SE of Topsail Beach to six miles S of Southport (i.e., approximately 24 miles east of the TIED HIGH parasailing area), moving west at 35 mph with brief wind gusts to 30 mph. About this same time, the weather at the parasailing area included 12 to 17 mph winds with two to four feet seas.

53. At about 1340, the wind increased to 19 to 25 mph, as the outermost bands of the severe storm reached the area, and continued to increase reaching speeds estimated between 23 to 34 mph with gusts upward to 40 mph. Seas became choppy with seas four to six feet with occasional eight-foot crests.

54. Based on testimony and data from the closest available weather station, the following is an approximation of the observed weather conditions at the parasailing area before and during the casualty:

Approximate Time	Event	Approximate Distance from Storm (miles)	Weather at Parasailing Area
1300	TIED HIGH departs dock	24	12 to 17 mph winds with three to four foot seas
1320	TIED HIGH arrives at parasailing area	12	
1325	1st set of passengers in flight	9.5	
1340	2nd set of passengers in flight	1	19 to 25 mph winds with three to four foot seas
1342	Passenger [redacted] makes first attempt to call vessel owner	0	23 to 34 mph winds with gusts to 40 mph; choppy seas with four to six foot swells with an occasional eight-foot crest
1349	First 911 call		
1350	Towline parts		
1406	First responders pull passengers to shore		19 to 25 mph winds with three to four foot seas

Preparations for Emergencies:

Passenger Safety Briefing

55. The federal regulation of 46 C.F.R. § 185.506 requires the master of a small passenger vessel to provide a passenger safety orientation before getting underway or as soon as practicable thereafter. The required safety orientation focuses on the actions passengers must take during an emergency but does not include aspects of parasail operations. At no time did the master, his deckhand, or anyone on behalf of the company[11] provide a passenger safety orientation to the passengers as required by federal regulation.

56. The PAPO OSAG requires a parasailing safety brief to be provided to the passengers before getting underway on a voyage. This briefing must include, among other things: (1) a description of the activity itself; (2) safety precautions while underway and in flight; (3) warnings and procedures for unexpected events such as water landings, equipment malfunctions, and towline separation; and (4) procedures in the event of an emergency onboard the vessel. The owner and

[11] Ocean Isle Beach Watersports, Inc. owns the TIED HIGH and all associated parasail equipment onboard the vessel, but leases the TIED HIGH and all of its equipment to North Carolina Watersports, Inc. Both of these companies are owned exclusively by Mr [redacted] When used in this report, the term "company" collectively refers to Ocean Isle Beach Watersports, Inc., and North Carolina Watersports, Inc., and the terms "owner," "vessel owner," or "company owner" refer to Mr. [redacted]

master of the TIED HIGH are former members of PAPO. As a condition of membership, PAPO requires its members to pass a test demonstrating knowledge of the PAPO OSAG. While the owner and master's membership to PAPO had expired, during testimony they both stated they had a working knowledge of the PAPO OSAG. At no time did the master, his deckhand, or anyone on behalf of the company provide a parasailing safety brief to the passengers.

57. As a condition of coverage, North Carolina Watersports insurance policy (Operating Restrictions) required:

> *"The insured shall provide industry approved safety instructions and training and shall require the customers to execute a Waiver of Liability."*

At no time did the master, his deckhand, or anyone on behalf of the company provide safety instructions and training to the passengers.

Assumption of Risk and Release of Liability Waiver

58. Prior to boarding the TIED HIGH, the vessel owner required the passengers of legal age and the parent of the four minors to sign an assumption of risk and release of liability waiver. By signing the waiver, the waiver states that the passengers individually affirm and acknowledge that they *"have been fully informed of the inherent hazards and risks associated with Parasailing,"* including but not limited to the following:

(1) changing water flow, tides, currents, wave action and ship's wakes;
(2) collision with any of the following: a. other participants, b. the watercraft, c. other watercraft, d. man made or natural objects, e. shuttle boat;
(3) wind shear, inclement weather, lightning, variances and extremes of wind, weather and temperature;
(4) my sense of balance, physical condition, ability to operate equipment, swim and/or follow directions;
(5) collision, capsizing, sinking, or other hazard that may result in wetness, injury, exposure to the elements, hypothermia, impact of the body upon the water, injection of water into my body orifices, and/or drowning;
(6) the presence of insects and marine life forms;
(7) equipment failure or operator error;
(8) heat or sun related injuries or illness, including sunburn, sun stroke or dehydration;
(9) fatigue, chill and/or reaction time and increased risk of accident.

In addition, by signing the waver, the waiver states the passengers individually affirm and acknowledge that:

> *"I have been trained in the safe use of Watersport equipment to my complete satisfaction, and I am physically/mentally able to participate in the water sport activities to which I am about to engage."*

59. When discussing the assumption of risk and release of liability waiver during testimony, passenger Ms. [redacted] stated the owner provided little to no explanation of its contents to the passengers, but when questioned by the passenger(s), stated *"Anything that's fun*

requires that you sign a paper like that, but it's no big deal." After signing the waivers, the passengers boarded the TIED HIGH and the master embarked on the scheduled voyage.

Crew Qualifications, Training and Experience

60. Federal regulations of 46 C.F.R. §§ 185.420, 185.520-524 require the licensed master to conduct sufficient drills to make sure that all crewmembers are familiar with their duties during emergencies that include abandoning ship, recovery of persons who have fallen overboard, and fire. The drills and training are required to be logged or otherwise documented for review by the Coast Guard upon request. After the casualty, the company owner and master were unable to produce any relevant training logs or records demonstrating compliance with the federal regulations.

61. The regulations of 46 C.F.R. §§ 185.420, 185.520-524 are duty requirements and not qualification standards[12], and do not require training specific to parasail operations and/or emergency procedures for potential parasailing events such as water landings, equipment malfunctions, and towline separation.

62. The master, Mr. [redacted] obtained his OUPV license on July 22, 2002, and started parasailing in 2003 as a deckhand aboard an uninspected parasail vessel owned and operated by Sky Pirates out of Ocean City, Maryland. While serving as a deckhand, he acquired parasailing knowledge and training from Mr. [redacted] During this time, he flew 55 gallon drums filled with water to simulate the weight of passengers and learned the art of parasailing. After four months of on-the-job training and experience, he was permitted by Sky Pirates to serve as the master aboard the company's vessels.

63. During testimony, the master stated the curriculum taught in the sea school he attended to obtain his Coast Guard license focused mainly on plotting and Rules of the Road with little classroom time spent on weather. After earning his license, he never received any formal training on parasailing, weather, emergency response, etc.

64. The deckhand, Mr. [redacted] obtained his OUPV license June 9, 2008, and started parasailing in 2008 as a deckhand aboard two inspected parasail vessels operated by North Carolina Watersports, Inc. While serving as a deckhand, he acquired parasailing knowledge and training from the master, Mr. [redacted] and the company owner, Mr. [redacted]

65. During testimony, the deckhand stated the sea school curriculum focused mainly on plotting and Rules of the Road with little classroom time spent on weather. After earning his license, he never received any formal training on parasailing, weather, emergency response, etc.

66. As a condition of coverage, N.C. Watersports, Inc. insurance policy required:

> *"All 'insured vessels' shall be with a crew of no less than two (2) members, including a Master. The Master must have at least twelve (12) months experience with parasail vessels in waters within the coverage territory or be certified by an accredited Mastering course."*

[12] Meaning there is not a performance standard that can be used to determine if a crew member is actually trained and ready to respond to an emergency.

At the time of the casualty, the master of the TIED HIGH had approximately 9 months experience with parasail vessels in waters within the coverage territory.

67. The company owner, Mr. [redacted] served as the master of the TIED HIGH during Coast Guard inspections. During the TIED HIGH's last inspection, the attending Coast Guard marine inspector ran emergency fire and man overboard drills while underway.

68. Neither the master or deckhand had ever participated in a Coast Guard inspection, nor had they conducted or participated in any emergency drill prior to the casualty. During the 2009 parasail season, the company owner, master, and deckhand discussed on a few occasions some basic scenarios regarding what should be done in an emergency. During testimony, however, the deckhand stated he could only recall this occurring once at the start of the 2009 parasail season. The company owner, the master, and the deckhand had never attempted or practiced these basic scenarios, or kept records of any relevant exercises, drills, or training.

Parasail Equipment:

69. Parasailing equipment is generally understood to mean equipment used specifically for parasailing, including parasails, clips, parasail harnesses, shrouds, webbing, towline, tow post, roller head, winch, and winch controls. In normal operation, the lines from the parasail canopy are attached to the riser. The multi-flyer bar[13] hangs below the riser and the harness containing the passengers is suspended from the multi-flyer bar. The towline is also attached to a towing yoke on the riser and to a winch located below the deck on the parasail vessel. The towline travels from the winch almost vertically upwards through the center of the tow post, out through the roller head to the yoke. The winch controls the altitude of the canopy and provides a controllable take off and landing for the passengers.

Winch System

70. The TIED HIGH's parasailing winch drum was built by Mark I Industries and is made of heavy duty, stainless steel parts, equipped to handle 1,000 feet of 7/16-inch towline. After assembly, the winch drum was shipped to Commercial Water Sports for installation onboard the TIED HIGH. The winch drum is turned by a hydraulic motor, which is driven by the engine through a clutch and a power take-off (PTO) unit. The system has a hand operated control level located at the vessel's helm. Van Air and Hydraulics supplied Commercial Water Sports several significant components used in the hydraulic system. Installation of the winch system was completed by Commercial Water Sports. There are no recognized industry standards or regulations for designing, building, operating, maintaining or inspecting a parasail winch system onboard Coast Guard inspected small passenger vessels.

[13] Also commonly referred to as a flight bar or passenger bar.

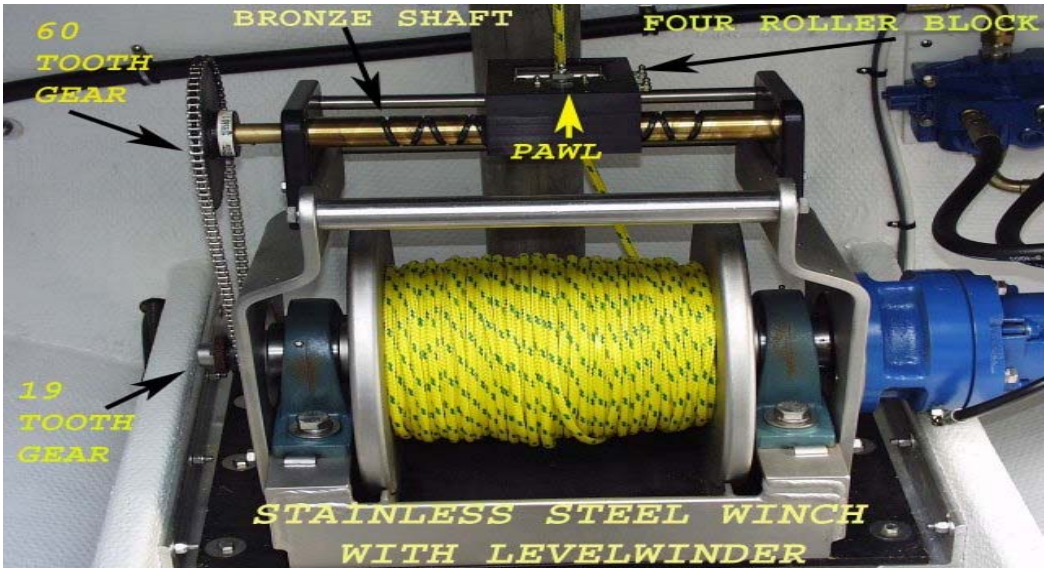

Figure 15. Picture of a winch similar to the winch onboard the TIED HIGH

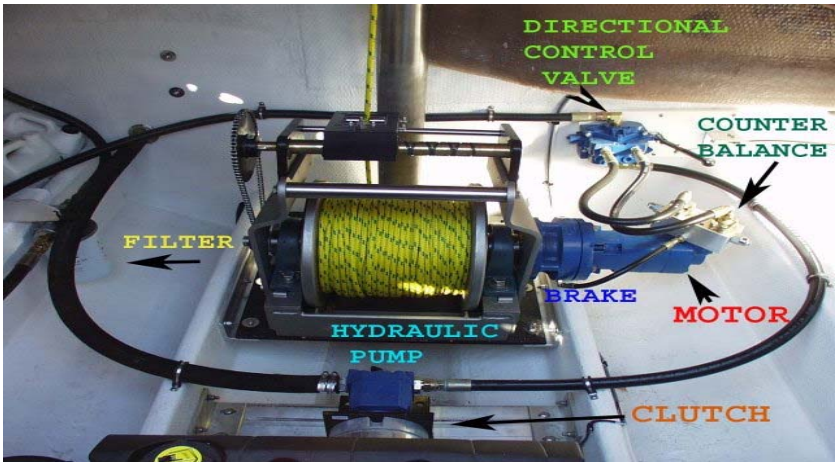

Figure 16. Picture of a hydraulic system similar to the hydraulic system onboard the TIED HIGH

Towline

71. The towline in use onboard the TIED HIGH was a 7/16-inch diameter Double Esterlon polyester double braided rope supplied by Commercial Watersports Inc., a distributer for Yale Cordage, the manufacturer. Advertising literature supplied by Yale Cordage in September 2009, indicated the rope is designed for industrial use and offers low stretch, high strength, and an excellent wear life. According to advertising literature, the line has an average and minimum breaking strength of 7,600 pounds and 6,840 pounds, respectively, and has a recommended safe working load of 1,900 pounds. Similar advertising literature acquired in December 2009, indicated that the working load had been reduced to 1,520 pounds. The working load is based on static or moderately dynamic lifting/pulling operations. Instantaneous changes in load, up or down, in excess of 10% of line's rated working load constitutes hazardous shock load and voids normal working load recommendations.

Towline Guide

72. A tri-roller head with a two and a half inch diameter swivel mount, equipped with bearings, two vertical rollers on each side, one horizontal roller and a safety mechanism called a knot breaker at the bottom of the line guide was installed on the vessel's tow post. The roller onboard the TIED HIGH was mounted on the tow post using set screws. The roller swivels from left to right at approximately 180 degrees as passengers are in flight.

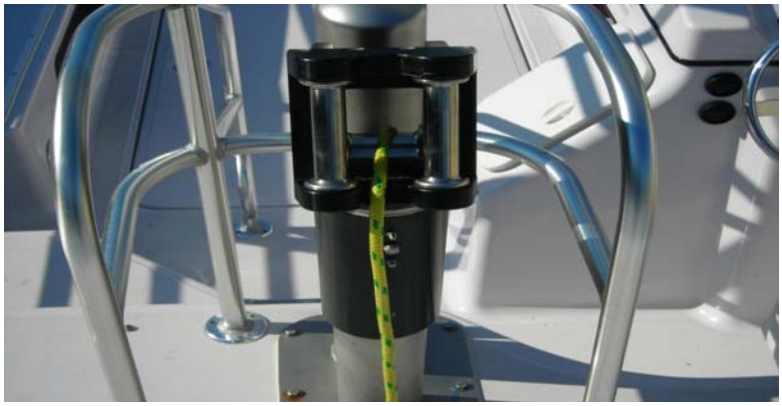

Figure 17. Picture of a Tri-roller head similar to the tri-roller head onboard the TIED HIGH

Towline Connection

73. The towline onboard the TIED HIGH was fastened to a towing yoke on the riser using a basic "bowline knot" and the other end was secured to the winch located below the deck of the parasail vessel.

Figure 18. Graphic of a standard bowline knot

Parasail Canopies and Harness

74. The parasail involved in the casualty was designed and manufactured by Custom Chutes Inc., and is called an XXtreme 39-foot parasail. The XXtreme 39-foot parasail was developed over many years from the original United Kingdom (UK) 16 panel design into a high lift, low drag parasail for commercial operators. A Custom Chutes Inc. label on the parasail included on the right side, the serial number , "0207475", the size, "39 ft", and the date "02/2007". On the right side of the label the wind speed "12 mph", the minimum weight "150 lbs" and the maximum weight "560 lbs" were displayed.

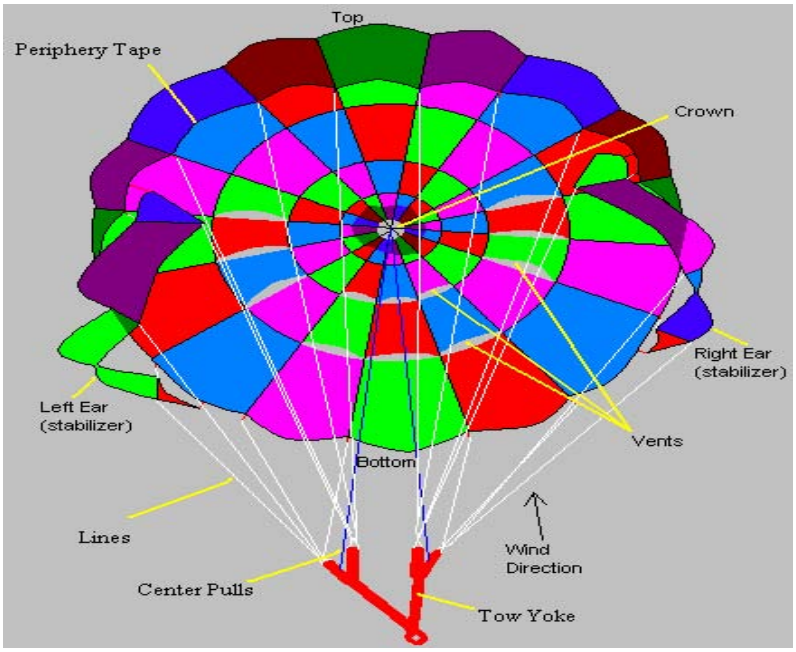

Figure 19. Design elements of a parasail

75. The parasail canopy is constructed from 1.3-ounce high tenacity silicone coated rip stop nylon, sewn together with 1.5-inch pre-shrunk nylon tape on a flat seam (seven times stronger than the actual material). The 16 shroud lines and two center lines are constructed of 7/32-inch braid on braid polyester cord with a breaking strain of 1,400 pounds each. The tow yoke and riser assembly is constructed from three layers of two-inch polyester webbing, each layer of webbing with a breaking strain of 3,500 pounds, with two inch stainless steel "D" rings for the harness connection.

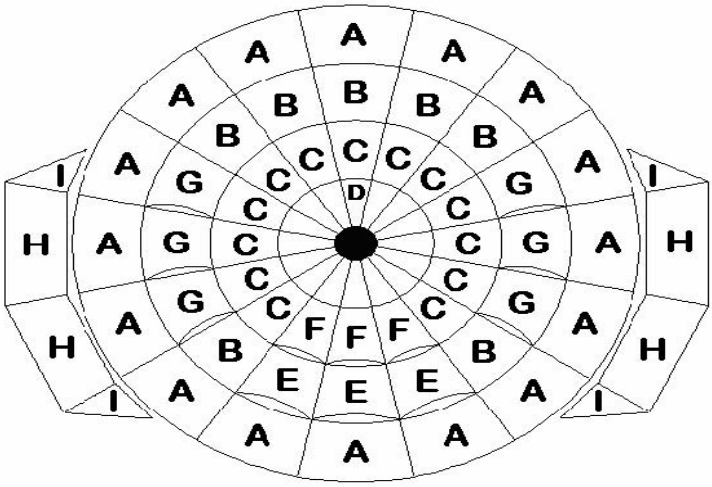

Figure 20. A 16 panel (gores) parasail layout. It has 9 different sized panels and is made up of 72 individual panels. This parasail was designed in 1974 by Brian Gaskin and was called the Water bird 16. This design is what all 16- paneled parasailing parasails are based on today.

76. Custom Chutes Inc. designed the multi-flyer bar. The multi-flyer bar is a device to fly one, two or three passengers, and may only be used on larger canopies above 32-foot. The bar is constructed from one half by two inch aircraft aluminum and uses an all metal, fully articulated

locking connection to the parasail (each snap hook rated at 2,700 pounds). The passengers are supported on three layers of two inch webbing, with a two inch stainless steel "D" ring at each strap. The bar was designed in the UK in the mid 1990's as a safer way of carrying more than one flyer. The bar also reportedly has a side benefit of making the canopy more stable, especially during turns.

Figure 21. Photo of a multi-flyer bar

77. Custom Chutes Inc. designed the harness. The parasail passenger harness comes in five sizes from XS to XXL and is based on a seated hang-glider harness from the mid 1970's modified at that time for parasailing. It is constructed from two and three inch polyester webbing with a padded seat and backrest. The design secures at the waist with a two-inch polycarbonate fastener and connects to the parasail with two stainless steel carabiners rated at 1,800 pounds each. Reportedly, this design is an improvement over the original parasail full body harness. When the flyers are being towed by the parasail, the pull from the waist reportedly allows the flyer to be towed across the top of the water unlike the full body harness which connects at the shoulders and as a consequence, when being towed by the parasail, pulls the flyer beneath the water.

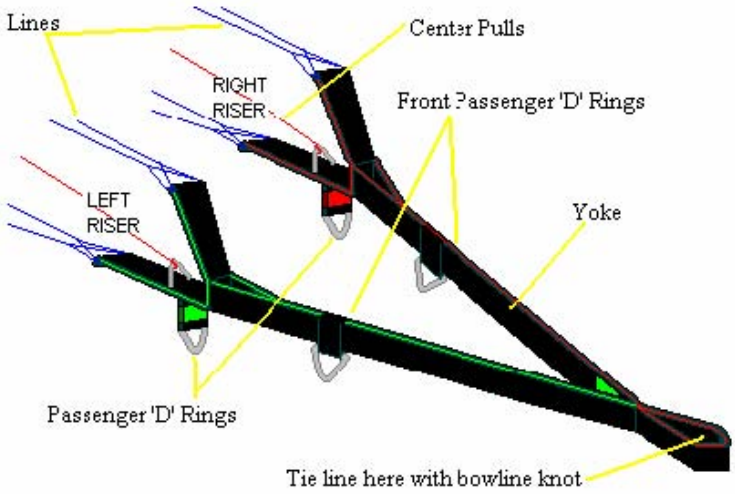

Figure 22. Graphic of a parasail harness

Other Equipment:

Marine Inboard/Outboard Engine

78. An inboard/outboard Volvo D6 engine built by Eckel Diesel LLC was installed onboard the TIED HIGH. The Volvo D6 is a 6-cylinder marine diesel engine with common rail high-pressure fuel injection, double overhead camshafts, 4 valves per cylinder, turbocharger, after cooler and a D6- 330 horse power, mechanical compressor with a 5.5 liters displacement. The fuel system is electronically controlled with common rail high-pressure fuel injection working at a pressure of 1,600 bars.

Figure 23. Photo of Volvo D-6 engine onboard the TIED HIGH

VHF Marine Radio

79. An ICOM, VHF Marine Transceiver, model IC-M302 was installed onboard the TIED HIGH. The IC-M302 is equipped with ten weather channels. These may be used to monitor broadcasts from the NWS or NOAA. The transceiver can detect a weather alert tone on the selected weather channel while receiving the channel during standby, on regular channel, or while scanning. The VHF radio onboard the TIED HIGH could receive weather alerts on 162.550 megahertz (i.e. NOAA weather channel one).

Figure 24. Photo of ICOM VHF radio, model IC-M302

Post Casualty Testing:

Equipment

80. On Saturday, August 29, 2009, MSU Wilmington personnel, Investigating Officer (IO), LCDR [redacted] MST2 [redacted] and marine inspector, Mr. [redacted] attended the TIED HIGH to conduct follow-up interviews and operational tests aboard the TIED HIGH. They conducted operational tests of the winch, engine, steering gear and VHF radio, and put the vessel back in the water for further testing to ensure overall safety of the vessel. All equipment and systems tested satisfactory. However, the tri-roller head was missing and presumed to have gone overboard during the casualty, perhaps during one of the rescue attempt. The IO took possession of several vessel documents and parasailing equipment. The IO removed approximately 985 feet of towline from the winch, seized the 39-foot parasail, passenger harness, and flight bar used by the two deceased passengers. The IO found a copy of the PAPO OSAG onboard the TIED HIGH.

81. In addition to the Coast Guard's operational tests conducted the day after the casualty, OEM Supply and Service, LLC, at the request of the Coast Guard, conducted a follow-up test on the TIED HIGH's winch and hydraulic system on December 7, 2009. The test confirmed the winch and the hydraulic system were in good working order.

82. At the request of the Coast Guard, the NTSB Office of Research and Engineering, Materials Laboratory Division, examined the parasail, harness and towline collected from the TIED HIGH, and conducted laboratory testing of the towline. Additionally, NTSB and the Coast Guard conducted operational field testing of a parasail, parasail equipment, towline and winch similar to those involved in the casualty in Bradenton, Florida. Results of the laboratory and field tests are summarized in NSTB Materials Laboratory Factual Report No. 10-040, dated June 14, 2010, which is included as an enclosure to this report.

Drug and Alcohol

83. At about 1500 on August 28, 2009, less than one hour after Ms. Lorrie Shoup and Ms. Cynthia Woodcock were pronounced deceased and the remaining passengers were helped off the TIED HIGH, Senior Wildlife Officer, [redacted] from the North Carolina Wildlife Resources Commission, conducted post casualty alcohol testing (breathalyzer) on the master and deckhand of the TIED HIGH. The alcohol tests were witnessed by a police officer from the Ocean Isle Beach police department. All tests were [redacted].

84. At about 1845 on August 28, 2009, the master and deckhand submitted to chemical testing in accordance with USCG/DOT regulations as required by 46 C.F.R. Part 4.06. The two crewmembers submitted urine samples at Medac-Corporate Health in Wilmington, N.C. The urine samples were shipped to Quest Diagnostics Inc. for testing, and were reviewed and approved by Dr. [redacted] (Medical Review Officer). All tests were [redacted].

Medical Examiner

85. Autopsies were performed on the deceased by Dr. [redacted] (Autopsy Prosector) of Coastal Pathology Associates, P.A. The medical examiner report revealed that passenger

Cynthia C. Woodcock sustained blunt trauma to the head, trunk and upper extremities. The most significant injury was a vertebral fracture and dislocation with significant spinal cord injury. On the right side there were posterior fractures of her ribs with tearing of the pleura and a small amount of blood in the right chest cavity. The cause of death was blunt trauma with a cervical spine fracture. Passenger Lorrie D. Shoup sustained a dislocated fracture of the thoracic vertebrae, multiple posterior rib fractures, mediastinal hemorrhage and there was at least one liter of blood in each chest cavity. The cause of death was exsanguination secondary to thoracic blunt trauma.

Analysis

Existing Authorities and Standards:

1. During the course of this investigation, a search for existing standards that apply to parasailing equipment, personnel and operations identified the following:

International

a. The government of Queensland, Australia instituted a standard applicable to parasailing from a commercial vessel under their Transport Operations (Marine Safety) Act 1994. The standard, referred to as Transport Operations (Marine Safety – Parasailing) Standard 2007, became effective on June 15, 2007, and includes requirements for the parasail vessel's winch, towline and associated parasail equipment, and the parasail operation itself.[14]

Federal

b. Parasail vessels that carry more than six passenger for hire are subject to Coast Guard inspection pursuant to 46 U.S.C. § 3301(8), and the federal inspection regulations of 46 C.F.R. Subchapter T - Small Passenger Vessels (Under 100 Gross Tons). These regulations currently do not address a parasail vessel's winch, towline and associated parasail equipment, or the parasail operation itself.[15] Under the authority of 46 U.S.C. § 3306, however, the Coast Guard may prescribe regulations that address parasail vessel's winch, towline and associated parasail equipment, and the parasail operation itself, if deemed necessary to secure the safety of individuals while parasailing from inspected vessels.

c. Parasail vessels that carry six or fewer passengers for hire are not subject to Coast Guard inspection. These uninspected vessels are subject to the federal regulations of 46 C.F.R. Subchapter C – Uninspected Vessels, and the federal statutes and regulations that apply to recreational vessels. Under this statutory and regulatory regime, there are no federal regulations that focus on parasail operations. Further, it is unclear whether the statutory authority provided to the Coast Guard by 46 U.S.C. Chapter 43 – Recreational Vessels, gives the Coast Guard the authority to prescribe such regulations.

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[14] *See* http://www.legislation.qld.gov.au/LEGISLTN/SLS/2007/07SL110.pdf

[15] Final agency action taken by the Coast Guard on parasail related safety recommendations indicate, that as recently as August 31, 2009, parasail operations were considered recreational activities outside the normal scope of regulated activities and not within the Coast Guard's assumed expertise. *See* MISLE Incident Investigation Activity Number 3032578.

State and Local

d. While parasailing typically occurs in waters in which individual States and/or local government entities have jurisdiction, this investigation did not find any applicable regulations for the State of North Carolina that focused on commercial parasail safety.

Industry

e. To fill what is felt as a void in the oversight of parasailing, the Parasail Safety Council (PSC)[16] was organized in 1998, and the Professional Association of Parasail Operators (PAPO)[17] was organized in 2003. These safety organizations have attempted to bring together parasail business owners and operators to promote standard operating practices and to agree on standard technical equipment for the parasail industry.

f. The PSC has proposed safe operating guidelines for parasailing that it intends to present to State and federal authorities for their consideration.[18] These guidelines are available to the parasail industry and were developed on the premise that 95% to 98% of all serious parasail accidents and deaths could be reduced or eliminated if operators would adopt basic operating guidelines involving passenger safety briefings, basic survival training, pre-flight weather evaluation, operating wind speeds, towline length limitations, and shoreline proximity or other fixed and moving objects (boat traffic, personal watercraft, wind/wave surfers, etc.)

g. The PAPO has also developed and published Operating Standards and Guidelines (OSAG) for safe parasail operations.[19] These standards are available to PAPO members, the parasail industry, and the public. All PAPO members, as a condition of membership, among other things, must adhere to the OSAG while conducting commercial parasail operations.

Parasail Vessel Casualties:

2. The Coast Guard Office of Investigations and Analysis has conducted limited analyses of parasail vessel casualties reported to the Coast Guard for the 17 year and eight month period between January 1, 1992 and September 1, 2009. According to Coast Guard records, there were 86 casualties involving 108 injuries and 6 deaths (i.e., approximately 6 injuries and 0.3 deaths per year) during this period.[20] Of these, 103 injuries and five deaths involved passengers, while the remaining involved crewmembers. For the calendar years 1992 to 2001, inspected parasail vessels accounted for 16% of the total parasail casualties. The percentage of casualties attributed to inspected parasail vessels nearly doubled reaching 30% for the years 2002 to 2009.[21]

[16] *See* http://www.parasail.org
[17] *See* http://teampapo.org
[18] *See* http://www.parasail.org/RULES%20AND%20REGULATIONS%20FOR%20COMMERICAL%20PARASAILING%20-%20UPDATED%202009.pdf
[19] *See* http://www.teampapo.org/documents/2006PAPOOSAG_000.pdf
[20] According to its records, the PSC estimates that from 1990 through 2009 there were over 384 accidents, 78 of which resulted in serious bodily injury and 22 deaths in the U.S. and its territories (i.e., approximately 4 injuries and 1.2 deaths per year).
[21] Over the same time period, the number of commercial parasailing vessels operating in the Fifth Coast Guard District increased by 438%, from eight to 43.

3. The analyses conducted by the Office of Investigations and Analysis are limited by several factors. The total number of parasail vessels in operation and the amount of parasail activity is unknown. Thus, the data cannot be normalized and easily compared to the death and injury rate of other transportation modes, amusement rides, or recreational sport activities (e.g., sport diving, sport fishing, water-skiing or white-water rafting). Further, there is no requirement for parasail operators to report casualties to the Coast Guard that occur outside of U.S. navigable waters (i.e., within waters that are exclusively under a State's jurisdiction), or that did not result in serious injury or death (e.g., a towline or winch failure that did not result in an injury requiring treatment beyond first aid).[22] Therefore, the Coast Guard's casualty data may not be representative of the entire parasailing industry and may underestimate the frequency of casualties and associated injuries. Complicating the analysis is that current Coast Guard marine safety casualty investigation guidelines do not address the importance of evaluating the adequacy of the parasail towing equipment and operations, and numerous investigations lacked sufficient detail to determine causal factors.[23]

4. Despite the limitations of its data, the Office of Investigations and Analysis was able to conclude that weather conditions appeared to be a factor in 40% of all passenger injuries recorded for parasailing activities. The causes of injuries generally fell into three categories: towline failure, winch failure, and other failures.

a. Towline Failures: For the casualties examined that involved a towline failure, the majority were attributed to weather conditions related to wind gusts, passing weather front movements, and rolling or choppy seas.

b. Winch Failures: The casualties involving a winch failure were associated with the inability to bring the passengers back aboard the vessel, either due to mechanical failure, the winch's capacity being exceeded making it difficult to retrieve the passengers against the head wind, or the towline free spooling—where the towline runs out and detaches from the vessel through the winch.

c. Other Failures: The third category involved casualties that resulted in serious injury where neither the towline nor the winch failed. Examples include falling out of the harness or striking objects while aloft, and slips, trips, and falls while being put aloft or landing.

Size and Growth of the Parasailing Industry:

5. A review of MISLE data indicates that the growth in parasailing has been dramatic. In 1998, there were between two to seven commercial parasail vessels operating in the Fifth District area of responsibility (AOR), which includes southern New Jersey, eastern Pennsylvania, Delaware, Maryland, District of Columbia, Virginia, and North Carolina. By 2010, the number of parasail vessels had increased to 49.[24] Of these 49 vessels, 27 (55%) are Coast Guard inspected small

[22] *See* 46 C.F.R. Subpart 4.05
[23] *See* Coast Guard Office of Investigation and Analysis Division report titled "Parasailing Casualties," dated Sept. 1, 2009. According to this report, the investigations generally only indicated that the lines parted and for the most part did not discuss the type, rating, length, condition of the line in use, the nature of the failure, or conditions that may have contributed to the failure, as in abrasion, age, sun-weathering, etc.
[24] The 49 vessels are owned and operated by 34 distinct parasailing companies.

passenger vessels while the remaining 22 (45%) are uninspected.[25] Nationwide, there are approximately 112 inspected parasail vessels.[26]

Commercial Parasail Vessels in Operation in the Fifth Coast Guard District

Coast Guard Sector Area of Responsibility	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total	No MISLE Data
Sector Delaware Bay	1	0	0	1	0	1	1	0	2	3	2	4	1	16	5
Sector Baltimore	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sector Hampton Roads	0	0	0	1	0	3	3	1	0	1	3	1	0	13	0
Sector North Carolina	1	3	0	1	0	1	0	3	2	1	2	1	0	15	0
Total Fleet Size	2	5	5	8	8	13	17	21	25	30	37	43	44		49

Operational Risk Management:

Unique Features of Parasailing

6. There are some features however, that make parasailing unique from other recreational sport activities conducted from commercial vessels that involve increased risk (waterskiing, recreational diving, etc.). These include the following:

a. Passengers who desire to parasail are not required to have knowledge, understanding, training, skill, or experience prior to engaging in parasailing.

b. There are no requirements for operators to provide passengers with training on the parasail canopy and its dynamics while in the air, emergency evacuation procedures during unexpected water landings, etc., and there is no reasonable expectation that passengers come to the vessel with any pre-existing and relevant knowledge or training.

c. Parasailing involves inherent risk and an inexperienced and/or uninformed person may overestimate his or her physical and mental ability to manage the unique risks associated with conducting this adventure activity in a routine or emergency situation within the marine environment.

d. If training and education is provided by the operator, there are no requirements for passengers to have the physical or mental capacity to perform the procedures in an emergency.[27]

e. Since the passenger is under the total control of the operator while aloft, the passenger may fail to recognize that the activity has the potential to require physical and mental capabilities beyond that required during a typical amusement ride.

f. The average passenger may have little understanding that the activity is not regulated by the Coast Guard or other governmental entities, and that the responsibility to manage the risks

[25] In the Fifth District, parasail vessels make up approximately 4% of the small passenger vessels that are inspected under 46 C.F.R. Subchapter T.
[26] The approximate number of uninspected parasail vessels operating in the U.S. is unknown.
[27] Due to the inherent risks of parasailing, industry practice is to require all passengers of legal age or if a minor, a parent or legal guardian, to read and sign an assumption of risk and release of liability waiver prior to parasailing.

falls primarily with the parasailing company, the operator, and the passenger. This misconception is often fostered by parasail companies that emphasize within their advertisement literature the fact that the company's vessels are Coast Guard inspected, and/or the operator holds a Coast Guard license as an assurance that the parasail activity is safe.

Roles and Responsibilities

7. Those potentially with responsibilities governing commercial parasail operations include the Coast Guard, State and local governments, the vessel owner and operator, and the passenger.

8. The Coast Guard has never sought to regulate recreational sport activities. The Coast Guard develops and ensures compliance with marine safety regulations and standards to prevent death and injury to tens of thousands of U.S. mariners, millions of passengers on ferries and other vessels, and tens of millions of recreational boaters. The Coast Guard tracks commercial mariner, commercial passenger, and recreational boating deaths and injuries as measures of annual marine safety performance. When measuring its performance in reducing commercial passenger deaths and injuries from passenger vessels operating in U.S. waters, the Coast Guard excludes passenger deaths, disappearances or injuries associated with recreational diving activities.[28] By contrast, deaths and injuries associated with parasailing operations have not been excluded, but it is unclear as to whether the inclusion of parasailing data is intentional or if the exclusion was deemed unnecessary due to the infrequency of parasail related incidents in comparison to the annual averages of commercial passenger death and injuries.

9. As discussed in the *Existing Authorities and Standards* section of this report, there are no applicable State or local regulations within North Carolina that focus on commercial parasail safety. Thus, in the absence of a regulatory regime and its enforceable standards, the responsibility to manage parasailing risks falls primarily with the parasailing company, the operator, and the passenger.

Safety Incentives

10. This regulatory environment may provide incentive for an owner or operator to forego investments that enhance parasail safety in order to compete with other companies that have also chosen to forego the expenses of safety improvements. Similarly, it is possible that an owner or operator may downplay the risks associated with the activity when attracting potential customers.[29]

11. The owner and master of the TIED HIGH are former members of PAPO, and a copy of the PAPO OSAG was located onboard the vessel after the casualty. All PAPO members, as a condition of membership, among other things, must adhere to the OSAG while conducting commercial parasail operations, be subject to Compliance Program audits and/or inspections, and

[28] *See* Appendix, USCG Marine Safety Performance Plan FY 2009-2014

[29] A search of online parasail advertisements found a company that was boasting that it had flown passengers as young as three and as old as 93. This same company, when discussing the risks and the possibility that an emergency situation may be encountered, stated the following: *"In the unlikely event of problems with the boat or tow line, the parasail would slowly float down and gently land in the water. Safety flotation jackets are worn by all fliers, so there is no risk of drowning. The boat will circle around immediately, so by the time you land safely in the water, we'll be there to pick you up."*

have a valid insurance policy written through an approved carrier. PAPO membership costs range from $747 to $947 dollars per year.[30] Approved carriers often require PAPO membership in order to underwrite parasail liability policies, and insurance costs from approved carriers can be several thousand dollars per year.[31] While it is difficult to correlate PAPO membership and compliance with the PAPO OSAG to increased parasail safety, the standard clearly provides a benchmark of safety that addresses the risks of parasailing and establishes a compliance audit program.

12. The owner of the TIED HIGH indicated that in order to obtain liability insurance as a new parasail company, the company and its vessel operators were required to be members of PAPO as a condition of coverage. Once the company was in business for a period of time, the owner was able to obtain insurance from Marine Underwriters Laboratory Limited, a company that does not require PAPO membership as a condition of coverage and which offered a premium significantly lower than the standard market rate.[32] While Marine Underwriters Laboratory Limited does not require PAPO membership or compliance with a similar standard, compliance program, and/or inspection regime as a condition of coverage, it does require compliance with its own, albeit limited, operating restrictions**.**

13. The lack of enforceable standards specific to parasailing does not prohibit the Coast Guard from taking measures that serve as a deterrent and reduce the frequency of similar casualties. These measures include taking action against the license held by an operator of an inspected or uninspected parasailing vessel for acts of misconduct or negligence.[33] The Coast Guard may also pursue civil or criminal penalties, as appropriate, for negligent operations of a vessel.[34]

14. The underlying principle of these enforcement measures is that the threat of punishment influences company and individual behavior to the extent that safety gains a higher priority. Although, these measures may serve as a deterrent, they do not address known or latent unsafe conditions before actual harm occurs, nor do they systematically reduce competitive advantages within the industry that are enjoyed by those companies that may under invest in areas related to parasail safety.

[30] *See* http://www.teampapo.org/cost htm

[31] Typical annual premiums for liability insurance underwritten by First Flight Insurance Group, Inc., were found to range between $6,400 and $7,200. According to its literature, First Flight Insurance Group, Inc. was founded in September of 1996 to provide a viable, knowledgeable and competitive insurance market for niche markets related to recreational air and water sports. *See* http://www.firstflightinsurance.com/history.htm

[32] Marine Underwriters Limited is domiciled in St. Vincent in the West Indies and was represented by Marine Specialty Management, a broker / producer based in Lake Havasu City, AZ. Local news stories report that Marine Specialty Management does not have a license to operate in North Carolina, and as such does not have to conform to financial standards. Marine Specialty Management reportedly writes insurance policies with premiums that are generally 40% to 60% below the standard market rate.

[33] *See* 46 U.S.C. §§ 7701 et.seq.

[34] *See* 46 U.S.C. § 2302

Safety Management Systems

15. An effective safety management system requirement can be an important step in addressing both equipment issues that occur over time and human factors issues.[35] The underlying principle of a safety management system is the creation of a culture of self-regulation within a company, where the company and its individuals take responsibility for the actions taken to improve safety, rather than seeing safety as a set of externally imposed compliance criteria that must be met. A safety management system requirement offers the flexibility to have company policies, vessel operations procedures, and equipment maintenance procedures that are specific to parasail operations and the conditions under which a company and its vessels operate. If properly developed and implemented, a safety management system approach could be cost effective and contribute to safety improvements.

16. Safety management systems invoked by regulations however, have been difficult for regulated communities to implement effectively. It has required strong initial implementation efforts, followed by improvements based on several audit cycles, effective application of lessons learned over time, and effective regulatory oversight for such systems to make real differences in safety performance. The necessary steps for effective implementation can be cumbersome and difficult to maintain when applied to vessels with limited company personnel, routes and operations. In recognition of this, the Coast Guard has established a safety management system tailored to small passenger vessels that provides an equivalent level of safety to that provided by the ISM Code for larger ships.[36] The Coast Guard has also developed a job aid with templates to guide small passenger vessel companies through the process of developing a safety management system that is customized to company and vessel specific operations and procedures.

17. The government of Queensland Transport Operations (Marine Safety – Parasailing) Standard 2007 does not require a safety management system to be implemented, but it does require the company to conduct a written assessment of all the risks it foresees could arise in conducting parasailing, and to prepare a written contingency plan for eliminating, minimizing or responding to the risks. This targeted and simpler approach of addressing the inherent risks of parasailing versus implementing a safety management system that extensively covers all aspect of vessel operation may offer the most effective means to improve parasail safety.

Use of Industry Standards

18. In 2004, Coast Guard Sector St. Petersburg took the initiative to develop a local voluntary parasail examination program to increase the safety of parasailing in its AOR. The voluntary program generally adopts the standards of PAPO. Under the program, parasail operators voluntarily submit to a Coast Guard examination, and if found in substantial compliance with the standards, they are issued a Coast Guard decal generated locally and affixed to the vessel attesting to the operator's satisfactory participation in the voluntary safety program. Voluntary

[35] Small passenger vessels inspected under 46 C.F.R. Subchapter T that carry more than 12 passengers on an international voyage are subject to the International Safety Management (ISM) Code (IMO Resolution A.741(18)) and are required to have implemented an effective safety management system. *See* 33 C.F.R. Part 96

[36] *See* http://www.uscg mil/pvs/SPV.asp

compliance with the parasail examination program constitutes good marine practice and is not binding on the parasail operator nor enforceable by the Coast Guard.[37]
19. The standards of a recognized safety association, industrial or government organization can be given the same force and effect as if its contents had been published in the Code of Federal Regulations if it is incorporated by reference.[38] Incorporating by reference a standard that is published outside the Code of Federal Regulations is valuable in that such use or reference increases safety while not significantly increasing the burden on industry. When incorporated by reference, a standard becomes the governing requirement for the covered subject matter and is enforceable by the Coast Guard.

20. PAPO has developed and published its OSAG for safe parasail operations. These standards are available to PAPO members and the parasail industry, and include specifications that must be complied with at construction and during operation. They are not currently incorporated by reference into federal regulations. In the Fifth District, there are nine parasailing companies that are active members of PAPO. These active PAPO members own and operate 17 parasail vessels, or 35% of the total number of commercial parasailing vessels in the Fifth District AOR. There are three parasailing companies that are previous members of PAPO. Evidence indicates that the parasailing industry as a whole is widely familiar with PAPO's standards, as well as the existence of PAPO and PSC.

21. Coast Guard programmatic review leading to the approval, adoption and incorporation by reference of the PAPO OSAG, or an alternate industry standard, into Subchapter T, would likely impart minimal additional burden on the parasailing industry. It may also reduce the competitive advantages that may be enjoyed by companies that under invest in areas related to parasail safety.

Stability:

22. During the incident, the TIED HIGH lost its forward way and the parasail began towing the vessel by the stern. In an attempt to regain control of the vessel, the master attempted an emergency maneuver that included a 180 degree turn. This maneuver was quickly abandoned when the overturning moment created by the lateral force of the towline threatened to capsize the vessel. This failed maneuver and near capsize calls into question whether the TIED HIGH had sufficient stability to maneuver in an emergency situation when towing passengers in flight.

23. The Coast Guard has developed the stability criterion of 46 C.F.R. § 173.090 (i.e., towline pull criterion) that applies to vessels that are equipped for towing. This criterion protects against the hazards associated with a tow that veers off athwartships creating an unexpectedly large lateral force with a potential to capsize the vessel. The towline pull criterion was not applied to the TIED HIGH, and this investigation did not find one instance where the Coast Guard or the

[37] 46 C.F.R. § 176.800 permits OCMIs to use the published standards of recognized safety associations in the inspection of machinery, equipment, materials, and arrangements onboard vessels when such standards do not conflict with federal regulation and the risks of the operation warrant such use. Note, however, that the Coast Guard's Office of Design and Operating Standards has not explicitly approved or recognized any local parasailing industry standards.

[38] 46 C.F.R. § 175.600(b) lists the standards that are currently incorporated by reference into 46 C.F.R. Subchapter T, and the regulations affected.

parasail industry has applied the towline pull criterion to a vessel engaged in parasailing, nor did it find one instance where a parasail vessel capsized with a passenger in flight.

24. The lack of any stability related casualties in the parasail industry reflects the sufficiency of the safety factors inherent in the stability criteria historically applied to parasail vessels by the Coast Guard and industry. Although this casualty indicates that stability was a factor during the emergency response phase of the incident, there are numerous and less costly ways to prevent operations in such severe parasailing conditions as the next several paragraphs will address. These ways minimize the negative impacts of stability due to parasailing operations and should be applied prior to the application of the towline pull criterion of 46 C.F.R. §173.095, and/or the development and application of any additional stability criterion to parasail operations.

Safe Operating Conditions:

25. Inspected parasail vessels are designed and constructed to survive extreme case service conditions for their authorized route if the vessel is handled competently by the crew and if no equipment or material failure occurs. Sea conditions and/or approaching weather patterns or squall lines that may present minimal risk to vessel safety and stability, may present significant risk to parasail safety.

26. The operational limits for each vessel necessary to secure the safety of passengers are determined by the cognizant OCMI and recorded on the vessel's COI.[39] As it is not possible to accurately enumerate all combinations of safe operating conditions on a given passenger vessel's COI, OCMIs traditionally restrict small passenger vessels to operations in "reasonable operating conditions." The TIED HIGH's authorized route and conditions of operation as recorded on its COI did not include a restriction to operate in reasonable operating conditions.

27. The factors an OCMI may consider when determining an inspected vessel's operational limits include, among other things: the performance capabilities of the vessel based on its design, scantlings, stability, propulsion, speed, operating modes, maneuverability, and other characteristics, and the suitability of the vessel for nighttime operations and use in all weather conditions.[40]

28. While it is clearly difficult to define the safe operating conditions necessary for vessel safety and stability within the complexity of a vessel/seaway system, it is much easier to define safe operating conditions for parasail safety as the governing environmental factors are not highly dependent on the vessel's sea keeping capabilities. The primary factors for parasailing are driven by the parasailing canopy's performance while in the air, the transmission of loads through the towline, the winch's ability to retrieve the passengers in flight, and the ability to safely put into flight, fly and land passengers from the vessel in the prevailing weather conditions. A comparison of available safe operating condition standards (i.e., those of PAPO, PSC and Queensland) for parasailing indicates that there is a consensus that parasailing should not occur in winds over 23 mph.

[39] *See* 46 C.F.R. § 176.110
[40] *See id.*

Comparison of Safe Operating Condition Standards

	PAPO	PSC	Queensland
Operating Wind Conditions	20 mph or less	17.25 mph or less	23 mph or less
Operating Sea Conditions	6-ft seas or less for vessels over 28-ft	3-ft seas or less for vessels under 29-ft; and 5-ft seas or less for vessels over 29-ft	None specified
Other Conditions of Operation (not all inclusive)	Parasailing is prohibited when there is: rain, heavy fog, lightning w/in 5 miles; storm frontal system w/in 7 miles; when there are excessive or dangerous wind gusts present; when the vessel is not capable of making forward way w/ forward winch engagement & passenger(s) in tow; or when the passenger(s) in tow will not begin to sufficiently descend when forward way has been paused	Parasailing is prohibited when there is: rain, heavy fog; a small craft warning, a low pressure frontal system producing one or more fronts w/ extratropical storm formation; bands of thunderstorms producing high winds; or lightning w/in 15 miles	Parasailing is prohibited when there is: rain, heavy fog, lightning visible from the vessel; a storm approaching ; or when there are excessive or dangerous wind gusts present

Pre-flight Weather Evaluation:

29. A small passenger vessel must be operated in a manner that protects passengers from being injured.[41] More specifically, it is the master's duty to pay special attention to the prevailing visibility and weather conditions and the vessel's handling characteristics, and to operate the vessel in a manner that prevents a casualty.[42] Recognizing the susceptibility of certain vessels to the hazards of approaching weather patterns and squall lines, the Coast Guard recently published a proposed rule that emphasizes the master's responsibility to pay special attention to *forecasted* weather conditions, and requires a master to have the means to obtain or monitor the latest marine broadcast.[43]

30. On the morning of the casualty, Friday, August 28, there was a small craft advisory in effect, Tropical Storm Danny was organizing offshore and expected to make its closest approach to the area Friday night and early Saturday morning, and the NWS was reporting the presence of a life threatening surf zone for the area's beaches. This high level of weather activity was receiving frequent and extensive local and national news coverage that is typical whenever a tropical storm threatens the east coast of the United States.

31. With this level of weather activity and the heightened public awareness that comes with frequent and extensive news coverage of tropical storms, the vessel master reportedly watched The Weather Channel and checked www.weatherbug.com to obtain the forecast before reporting to work at the Ocean Isle Beach Fish Center on the morning of the casualty. During testimony, the master said he was unaware that Tropical Storm Danny was off the coast, that a small craft advisory was in effect, or that there was any prediction of inclement weather. Specifically, he

[41] *See* 46 C.F.R. § 185.100
[42] *See* 46 C.F.R. § 185.304
[43] *See* Notice of Proposed Rule Making (NPRM), 73 FR 49244

stated *"there was nothing that certainly alarmed me that I shouldn't go parasailing that day, at least from the forecast."* As the morning progressed on Friday, August 28, the master acknowledged that he did not check official or unofficial weather sources at any time for forecast updates.

32. Based on the available facts, it is highly unlikely that the vessel master watched The Weather Channel or visited the Weatherbug.com internet site as reported. If he did, he received a weather report similar to that of the NWS and decided to go parasailing in spite of the weather advisory.

33. As the day progressed, the company owner and vessel master failed to monitor the evolving environmental conditions and appreciate their significance on parasail safety. About the same time as the 1300 departure of the TIED HIGH, the NWS Wilmington issued a *Special Weather Statement* that showers and thunderstorms were producing heavy rain in the area and moving west at 35 mph with brief wind gusts to 30 mph on 162.550 megahertz (i.e. NOAA weather channel one). The master did not receive the NWS weather alert issued because he did not have his VHF radio on and was not monitoring marine broadcasts.[44] Moving west at 35 mph, the storm would quickly impact the vessel and its passengers.

34. The PAPO OSAG requires a pre-flight weather evaluation to determine if weather conditions are favorable for parasailing, and requires the master to "*use all means available to make such a determination.*" The OSAG states that no operator shall knowingly parasail in rain, heavy fog or during a known lighting storm within five miles from the parasailing area. At no time shall an operator willingly conduct parasail activities if it becomes evident that a storm frontal system is approaching within seven miles of the parasail operating area. The PAPO OSAG also requires operators to follow recommendations of equipment manufacturers with regard to parasail selection for passenger weight and wind speeds. In addition, to assist the operator in making these critical weather related decisions, the OSAG recommends operators have onboard a basic hand held wind speed meter and basic wind speed direction indicator.

35. Regarding the decision to get underway and engage in parasailing, the company owner stated he always allowed the master to make the final decision. In testimony, the master concurred that he makes the final call whether he will get underway and engage in parasailing activities.

36. Regarding the use of the VHF radio, the master stated it was in good working order and that he knew how to use it, yet he rarely used the radio while underway or engaged in parasailing activities.

37. The company did not have a written policy requiring the master to monitor the latest marine broadcasts while underway or while engaged in parasailing activities.

38. As a condition of coverage, the company's insurance policy required:

> *"The insured shall not knowingly operate in storm speed winds of 20 miles per hour, rain, fog, or during lightning storm which is within six (6) miles of operation."*

[44] During testimony, the master stated that he rarely turns on the VHF radio or monitors marine broadcasts while underway or engaged in parasailing activities.

39. The insurance policy did not specify by what means the company should use to make a determination as to whether or not conditions were suitable for parasailing.

40. Of the 25 parasail companies that operate in North Carolina and South Carolina, 23 including North Carolina Watersports, Inc. were conducting parasail operations on the day of the casualty. Of the 23, all with the exception of three had suspended operations by 1300 due to inclement weather. One company located south of Ocean Isle, NC, in Myrtle Beach, SC, suspended operations around 1330 based on local conditions. Another company located north of Ocean Isle, NC, in Hatteras, NC, suspended operations around 1400 based on local conditions.

Parasailing Equipment:

Towline

41. The towline in use onboard the TIED HIGH was a 7/16-inch diameter Double Esterlon polyester double braided rope supplied by Commercial Watersports Inc., a distributer for Yale Cordage, the manufacturer, and was placed in service on July 11, 2009, 32 days prior to the casualty.

42. NTSB forensically examined and conducted laboratory tensile tests on the TIED HIGH towline and a new (exemplar) 7/16-inch diameter Double Esterlon polyester double braided rope manufactured by Yale Cordage and supplied by the distributor. A series of tensile tests were conducted with both ropes without and with bowline knots. Additional operational testing of the TIED HIGH towline was performed under NTSB and Coast Guard supervision off the west coast of Florida at Bradenton. A parasail canopy, yoke, triple bar, and towline similar to those involved in the casualty were supplied by Custom Chutes, Inc., and a similar towing vessel and winch was supplied by YOLO Parasail, both based in Bradenton. The passenger load for the testing simulated the combined body weight (340 pounds) of the deceased passengers.

43. Detailed information of the laboratory and operational tests are contained in NSTB Materials Laboratory Factual Report No. 10-040, dated June 14, 2010. The Cordage Institute International Guideline # CI 2001-04, Fiber Rope Inspection and Retirement Criteria, provides information and procedures to inspect ropes and to establish criteria for evaluation. This guideline was reviewed, and the following comments are based in part on the NTSB Report and the Cordage Guideline:

Tensile Tests of New Towline

a. The exemplar rope average failure load of 6,390 pounds was 450 pounds (6.6%) below the manufacturer's minimum breaking strength of 6,840 pounds. NTSB considered this reduction in the as-tested strength to the manufacturer's minimum strength to be within marginally acceptable parameters. When new, the TIED HIGH towline breaking strength may have been similarly below the manufacturer's minimum breaking strength, but this cannot be confirmed.

b. The knotted exemplar rope always failed at the knot, and the average failure load of 4,184 pounds was a significant 2,656 pounds (39%) below the manufacturer's minimum breaking strength of 6,840 pounds.

Exemplar Rope	As Tested Average Breaking Strength (lbs.)	Percent Diff. from Manufacturer's Reported Minimum Breaking Strength
Without bowline knot	6,390	-6.6%
With bowline knot	4,184	-39%

Percent Difference with Knot	-35%

Tensile Tests of TIED HIGH's Towline

c. After 32 days of service, the TIED HIGH towline average failure load of 4,829 pounds was a significant 2,011 pounds (29%) below the manufacturer's minimum breaking strength of 6,840 pounds.

d. The knotted TIED HIGH towline average failure load of 3,415 pounds was a significant 3,425 pounds (50%) below the manufacturer's minimum breaking strength of 6,840 pounds. As with the exemplar rope, all failures were at the bowline knot.

TIED HIGH Towline	As Tested Average Breaking Strength (lbs.)	Percent Diff. from Manufacturer's Reported Minimum Breaking Strength	Percent Diff. from Exemplar Rope Average Breaking Strength
Without bowline knot	4,829	-29%	-24%
With bowline knot	3,415	-50%	-18%

Percent Difference with Knot	-29%

Visual Examination

e. A detailed visual examination of the TIED HIGH towline revealed that its diameter was 15% larger than the exemplar rope and broken filaments could be seen on its surface giving it a fuzzy appearance. This increase of diameter and fuzzy appearance is consistent with a braided rope that has filament breakage.

f. A detailed examination under magnification of the outer strands of the TIED HIGH towline found loose filaments concentrated at strand crossing points. This is considered consistent with an abrasive action between adjacent strands produced by cyclical loading and is commonly referred to as fatigue.

g. A detailed examination under magnification of the inner strands of the accident towline at its failure point revealed that the end of each strand appeared flat and perpendicular to the strand (squared), a feature associated with filament to filament abrasion at the crossover points of the braid resulting in a fatigue failure.

h. The accident towline had a Maxijacket™ coating intended to increase the line's abrasion, snag and ultra-violet resistance. This coating was significantly worn during the line's 32-day service life.

Operational Tests

i. The operational tests clearly indicated that the roller head through which the towline travels is a significant source of abrasion for the towline.

j. The operational tests performed on the TIED HIGH towline and subsequent analysis resulted in curve that can be used to approximate loads associated with the Custom Chutes Inc. XXtreme 39-foot parasail for combined vessel and wind speeds from 0 to 40 mph. Using this curve, the following observations were made:

(1) The manufacturer's revised recommended safe working load of 1,520 pounds was exceeded when the combined vessel and wind speed was approximately 23 mph.

(2) The manufacturer's original recommended safe working load of 1,950 pounds was exceeded when the combined vessel and wind speed was approximately 26 mph.

(3) The test winch's load capacity of 3,125 pounds (i.e., its ability to retrieve the flying passengers) was exceeded when the combined vessel and wind speed was approximately 33 mph. A similar situation could apply to the TIED HIGH's hydraulically powered winch.

(4) The knotted TIED HIGH towline average breaking strength of 3,415 pounds was exceeded when the combined vessel and wind speed was approximately 35 mph.

k. When steering the towing vessel cross wind and seas, the nearly instantaneous tension variations exceeded 10% of the towline's rated working load.

Towline Failure Analysis

44. The TIED HIGH towline was placed in service on July 11, 2009, 32 days prior to the accident of August 28. Over those 32 days, NTSB laboratory testing of the towline indicates it had a 29% reduction in strength. When the bowline knot's negative effects are included, the TIED HIGH towline strength was a significant 50% less than the manufacturer's minimum breaking strength of 6,840 pounds.

45. Overloading / Shock Loading: There is evidence that the TIED HIGH towline's loss of strength can at least be partially attributed to overloading and shock loading.

a. Exceeding the towline's working load of 1,520 pounds by two or more times or loading it to excess of 50% of its published breaking strength of 6,840 pounds constitutes overloading. Overloading can cause significant loss of strength and/or durability.[45]

b. When using the XXtreme 39-foot parasail, combined vessel and wind speeds in the vicinity of 32 mph constitute an overloaded condition for the TIED HIGH towline. When parasailing near the upper regions of what is generally considered a safe operating envelope (20-23 mph winds) with gusts present, the towline would likely be intermittently placed in an overloaded condition. Based on this and the operating practices of the company and master, it is probable that over its service life the TIED HIGH towline was placed in an overloaded condition, thus degrading its strength and durability.

c. Repeated overloading will cause a breakdown of yarns in the outer braid of a double braided rope causing it to look fuzzy and shock loading may cause internal melting of a rope's fiber. A detailed examination under magnification of the strands of the towline found that the inner strands were melted. It should be noted, however, that repeated overloading and shock loading result in damage similar as that caused by cyclical tension wear.

d. The casualty occurred in 23 to 34 mph winds with gusts to 40 mph. These conditions placed the towline in an overloaded condition leading to a failure.

e. It is standard practice during parasailing to make figure eights or to do 360-degree circuits with passengers aloft. These routes include steering the parasail vessel cross wind and seas. The operational field testing indicated that in weather conditions generally accepted as conducive to parasailing, the towline would be subjected to near instantaneous load variation in excess of 10% when crossing wind and seas. Instantaneous changes in load, up or down, in excess of 10% of line's rated working load constitutes hazardous shock load and voids normal working load recommendations. The damage caused by these shock loads are increased as the loads exceed the rope's safe working limit. This dynamic nature of the loads when crossing wind and seas calls into question the suitability of static ropes, or ropes designed with minimal stretch and low energy absorption, to be used for parasailing.

46. Cyclical Tension Wear: There is evidence that the TIED HIGH towline's loss of strength can at least be partially attributed to cyclical tension wear.

a. Ropes that are cycled for long periods of time within a normal working load range will gradually lose strength. This loss of strength is accelerated if the rope is unloaded to a slack condition or near zero tension between load cycles. The subsequent damage is commonly referred to as fatigue. Although there are various mechanisms for the breakdown of ropes under cyclic tension, the most common is fiber to fiber abrasion.[46]

b. A detailed examination under magnification revealed signs of fatigue [*See* Visual Examination section, pages 41 and 42, paragraphs (f) and (g)].

[45] *See* Cordage Institute International Guideline #CI 2001-04, Fiber Rope, Inspection and Retirement Criteria
[46] *See id.*

c. A detailed visual examination of the TIED HIGH towline revealed that its diameter was 15% larger than the exemplar rope and broken filaments could be seen on its surface giving it a fuzzy appearance. This increase of diameter and fuzzy appearance is consistent with a braided rope that has extreme filament breakage.

47. External Abrasion and Flex Fatigue: There is evidence that the TIED HIGH towline's loss of strength can at least be partially attributed to external abrasion and flex fatigue.

a. Operational testing of the TIED HIGH towline indicated that the roller head through which the towline travels is a significant source of abrasion and flex fatigue. As the towline rolls over the horizontally and vertically oriented rollers, the tension on the towline is sufficient to deform it and remove/wear the rope's coating material. The coating material is ejected by the abrasive action within the strands of the towline as the towline is deformed horizontally and vertically depending on the aspect of the parasail to the roller head during reeling operations. Constant bending over the roller's small radius surface causes flex fatigue damage.

b. External abrasion damage can typically be distinguished from cyclic fatigue in that it does not cause internal damage. The TIED HIGH towline had internal damage consistent with cyclic and flex fatigue however, the visible signs of deformation and removal of the towline's outer coating indicates that external abrasion damage occurs during routine parasailing operations and cannot be ruled out as contributory.

48. Bowline Knot: There is evidence that the TIED HIGH towline strength was significantly reduced by the bowline knot.

a. A bowline knot is the knot typically used throughout the parasailing industry to fasten the towline to the parasail harness as it is simple to tie and easy to undo. Most knots will induce structural damage and will reduce a line's breaking strength by as much as 50%.

b. To mitigate this structural damage, within the parasailing industry it is common practice to cut the bitter end of the towline back after a certain number of flights, thus discarding the damaged portion of the rope. The PAPO OSAG requires that a minimum of two feet be trimmed from the towline bitter end within a maximum period of 7 days, every 400 flights, or as may become necessary. As a condition of coverage, North Carolina Watersports' insurance policy required that a minimum of one foot be trimmed every 100 flights. Both the OSAG and the company's insurance policy required a written log be kept documenting the trimmings.

c. The TIED HIGH company owner, master, and deckhand stated they routinely trimmed the towline bitter end, but were unable to specify the frequency. The company did not maintain a written log of the trimmings, nor did it have any written procedures and policies in place governing the selection, inspection, and maintenance of its towlines.

d. After the casualty, the Coast Guard recovered 985-feet of towline from the TIED HIGH, indicating that 15-feet of towline had been trimmed in its 32 day service life. Thus, the TIED HIGH towline may have been trimmed at a frequency that would be in compliance with the PAPO OSAG, however, this cannot be confirmed due to the absence of written logs and the testimony of the TIED HIGH company owner, master, and deckhand.

e. Calculations performed by the Coast Guard Marine Safety Center in April 2008 indicated that a properly tied bowline knot will reduce a line's strength by approximately 37%.

f. Lab testing indicated that the bowline knot reduced the breaking strength of the exemplar towline by approximately 35% and that the TIED HIGH towline by 29%, thus supporting the calculations of the Marine Safety Center.

g. Unless a rope is specifically designed to use knots, they must not be used unless the working load is reduced by an appropriate amount (based on 50% of published rope strength unless specific contrary data is available).[47]

49. Other Damage: There is no evidence that sunlight degradation, heat, cuts, or other types of damage (e.g., dirt and grit from dried sea water) significantly contributed to the towline's loss of strength.

50. Service Life: An established standard or basis for towline selection, inspection and retirement from parasailing service does not exist. While the Cordage Guideline provides guidance on when to repair, downgrade or retire ropes based on the results of visual inspection, there is no evidence that this standard is widely known or used in the parasailing industry. Absent a standard, it is challenging to determine either qualitatively or quantitatively whether the TIED HIGH towline was used beyond its service life.

51. Safety Factors:

a. Design safety factors[48] for rope normally vary between 5 and 12, with ropes that secure or control valuable assets or whose failure would cause serious damage, pollution, or threat to life having higher safety factors than ropes in non-critical use.[49] Evidence indicates that parasailing is a severe application that leads to rapid degradation and loss of strength in a towline, the towline is routinely subjected to shock loads, and the use of a bowline knot significantly reduces its strength. These factors suggest that a large safety factor is warranted if towline failure is to be prevented.

b. The operational tests performed on the TIED HIGH towline and subsequent analysis resulted in curve that can be used to approximate loads associated with the Custom Chutes Inc. XXtreme 39-foot parasail for combined vessel and wind speeds from 0 to 40 mph. Using this curve, a combined wind of 12, 15, 20, 25 and 30 mph generates a 450, 700, 1,200, 1,700 and 2,350-pound load, respectively. If these loads define necessary safe working loads, safety factors can be applied to the each load and wind speed to determine the corresponding necessary minimum breaking strength that could be used as a basis for towline selection.

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[47] *See id.*

[48] Safety factors - is a term describing the structural capacity of a system beyond the applied loads or actual loads. Essentially, how much stronger the system is than it needs to be for a given load. Safety factors are calculated because comprehensive destructive testing is impractical on many projects, such as bridges and buildings, or early in the design cycle but the structure's ability to carry load must be determined to a reasonable accuracy.

[49] *See id.*

Towline Required Minimum Breaking Strength (lbs.)
for the Xxtreme 39-ft Parasail in Various Wind Speeds

Applied Safety Factor	12 mph wind	15 mph wind	20 mph wind	25 mph wind	30 mph wind
5	2,250	3,500	6,000	8,500	11,750
6	2,700	4,200	7,200	10,200	14,100
7	3,150	4,900	8,400	11,900	16,450
8	3,600	5,600	9,600	13,600	18,800
9	4,050	6,300	10,800	15,300	21,150
10	4,500	7,000	12,000	17,000	23,500
11	4,950	7,700	13,200	18,700	25,850
12	5,400	8,400	14,400	20,400	28,200

c. The TIED HIGH towline minimum breaking strength of 6,480 pounds, when new and undamaged, provides a safety factor of 5.4, if parasailing is limited to a wind of 20 mph or less as required by the PAPA OSAG. This safety factor is reduced to 2.8 if 10 mph gusts are permitted. The Custom Chutes Inc. XXtreme 39-foot parasail is recommended for use only up to 12 mph. If this recommendation is followed, the TIED HIGH towline safety factor is a significant 14.4.

d. When one considers that parasailing is a severe application that leads to rapid degradation and strength loss due to the combined effects of cyclical tension wear, shock loading, external abrasion and flex fatigue, the use of a bowline knot as a connection, and the potential that a failure endangers human life, it is clear that a safety factor approaching 12 is desired. Thus, evidence indicates the TIED HIGH towline may provide sufficient strength to be used with the XXtreme 39-foot parasail if the manufacturer's recommended maximum wind speed was not exceeded.

e. While the Cordage Guide indicates that a safety factor approaching 12 may be sufficient for parasailing, the TIED HIGH towline minimum breaking strength of 6,480 pounds is significantly larger than that the 4,800 pounds required by the PAPO OSAG, and the 5,600 pounds required by its insurance policy. This further highlights the need for a towline selection, inspection and retirement standard be developed and implemented within the parasailing industry.

f. A limited review of commercially available parasails indicates that available sizes range from 21-52 feet. Generally, the larger the parasail, the larger the manufacturer's recommended maximum payload and the lower the recommended maximum wind speed. The largest parasails can carry up to 700 pounds and be flown in wind as high as 10 mph. The smallest parasails are limited to 250 pounds but have the advantage that they can be flown in wind as high as 28 mph. In order to fully understand the relationship between parasail size, passenger load, wind speeds, and towline load, a series of operational tests would need to be conducted. The results of these tests could assist the development of towline selection criteria that if necessary could be tailored to specific parasail sizes and their limitations, and would ensure adequate safety is provided at all times.

Parasail Canopies and Harness

52. Examination of the parasail canopy, riser, multi-flyer bar and harness indicate that all were in good working condition at the time of the casualty with the exception of the riser's yoke, which was in a functional but poor condition.

53. The PAPO OSAG requires operators to follow recommendations of equipment manufacturers with regard to parasail selection for passenger weight and wind speeds.[50]

54. The crew of the TIED HIGH conducted two separate parasail voyages the morning of August 28 without incident.[51] The master stated that he flew the 46-foot parasail the morning but noticed the wind was picking up after his last flight, so he decided he would change parasails once he got back to the parasail area around 1300. The 46-foot parasail is the largest onboard the vessel, has a maximum load capacity of 650 pounds, and is recommended for use in wind up to 10 mph. Hourly wind observations from the Sunset Beach Nearshore Buoy, which is located approximately 6 miles from the parasailing area, indicate that the prevailing wind near shore ranged between 12 to 15 mph during the morning hours. Using the 46-foot parasail in these conditions violated the manufacturer's recommendation with regard to canopy selection and wind speed.

55. In the afternoon, the master flew the 39-foot parasail. The 39-foot parasail has a maximum load capacity of 560 pounds and is recommended for use in wind up to 12 mph. The actual wind at the parasailing area shortly after 1300 was between 12 to 17 mph, but increased to 19 to 25 mph around 1340, as the outermost bands of the severe storm reached the area, and continued to increase reaching speeds estimated between 23 to 34 mph with gusts to 40 mph when the towline parted. Using the 39-foot parasail in the conditions prevailing shortly after 1300 violated the manufacturer's recommendation with regard to canopy selection and wind speed.

56. The company did not have any written procedures and policies in place governing the selection, inspection and maintenance of parasail canopies and harnesses.

Preparations for Emergencies:

Passenger Safety Briefing

57. As a Coast Guard licensed mariner, the vessel master had an obligation to provide an adequate safety brief to the passengers aboard the TIED HIGH. As a former member of PAPO, the master should have known the importance of a proper parasail safety brief. By omitting this important step, the vessel master put the passengers at risk. A proper parasail safety brief would have included teaching passengers how to use the quick release to disconnect themselves from the parasail in the event of a line parting and a water landing. The process is fairly easy to teach and only takes a couple of seconds to execute.

[50] To assist, the OSAG recommends operators have onboard a basic hand held wind speed meter and basic wind speed direction indicator.
[51] Voyages left at about 0900 and 1100.

Crew Qualifications, Experience, and Training:

58. Emergency actions are the responsibility of the company, the licensed master, and his crew. While 46 C.F.R. §§ 184.520, 185.510-514 and 520-524 specifically address fire, heavy weather[52], and man overboard conditions, the Coast Guard promotes the development of vessel specific emergency instructions, and entrusts that owners and operators train vessel crews to properly respond to foreseeable emergencies.[53] These emergencies would include unintended water landings, winch system malfunctions, towline separation, and propulsion machinery failure with a passenger in flight.

59. Neither the master or deckhand had ever participated in a Coast Guard inspection, nor had they conducted or participated in any emergency drill to include fire, heavy weather, man overboard, unintended water landings, winch system malfunctions, towline separation, and propulsion machinery failure with a passenger in flight prior to the casualty.

60. During the 2009 parasail season, the company owner, master and deckhand discussed on a few occasions some basic scenarios regarding what should be done in a parasailing emergency. During testimony, however, the deckhand stated he could only recall this occurring once at the start of the 2009 season. The company owner, the master, and the deckhand had never attempted or practiced basic parasailing emergency scenarios, or kept records of any relevant exercises, drills or training conducted.

61. During the initial emergency response phase of the casualty (i.e., immediately after the line parted and the passengers descended into the water), the vessel master gave chase after the two passengers at the vessel's maximum speed in the choppy sea conditions. As the vessel came alongside the two passengers, the master instructed the deckhand to jump from the bow of the vessel onto the parasail in an attempt to deflate it. The deckhand did as instructed but was unsuccessful and the two passengers continued to be dragged through the waves. Custom Chutes Inc. has a training manual that covers standard emergency procedures, and in the event of a towline failure, the manual instructs the vessel operator to run parallel to the parasail while talking to the passengers to keep them calm.

> When it is safe to do so, the operator should: *"…pull in behind the parasail and stop the boat. Collapse the parasail onto the boat. If you miss the parasail back away quickly so the passengers do not collide with the boat. Repeat until you have the parasail collapsed. Keep talking to the passengers to keep them calm until they are onboard."*
>
> The manual acknowledges that it may be difficult to deflate big parasails over 37-foot. Specifically, the manual states: *"If you fly big parasails you may find it is too high to take hold of and collapse when you pull behind it. In which case drive along in front of the parasail, slow down and take hold of it with a boat hook. Once you have hold of the parasail stop the boat and collapse it."*

62. The vessel master stated he learned the rescue maneuver of jumping from one's vessel onto a parasail to deflate it from another parasail vessel operator, Mr. [redacted] During the

[52] As it relates to vessel stability and navigational safety.
[53] *See* Interim Final Rule, 61 FR 881

hearing, the vessel master stated that Mr. [redacted] was faced with an identical situation in July 2007. Due to inclement weather and with winds in excess of 34 mph, the towline of his uninspected small passenger vessel, SKY WINCH, parted under tension with two passengers aloft. As the passengers were being dragged through the ocean, Mr. [redacted] came along side them in the SKY WINCH, jumped from the vessel onto their parasail and managed to deflate it. The two passengers, both sisters [redacted] and [redacted] years old, were taken to the hospital for medical treatment and X-rays which were negative. The sisters sustained bruises and complained of neck pain.[54]

63. The master stated he had never been an emergency situation like the one he found himself in on August 28, 2009. During the emergency situation, he failed to exercise good judgment in that he did not hail the Coast Guard on Channel 16 VHF-FM (156.8 MHz) or dial 911 to request assistance.

64. When discussing emergency situations with the vessel master, the company owner stated he instructed the master to contact him first in an emergency situation. The owner never explicitly told the master to hail the Coast Guard or dial 911 in an emergency situation. The owner stated that he expected the master to know those options were always available to him.

65. The PAPO OSAG includes minimum crew experience requirements for the positions of "Qualified Flight Master." and "Qualified First Mate/Flight Technician." These requirements include, among other things, the following:

Qualified Flight Master:
▪ Must have successfully completed the on-line or written version of the OSAG Review Module. ▪ Must meet a minimum parasailing experience requirement of: 600 actual full rotation flights, with written verification of experience, or must have successfully passed a flight training course and/or a flight master evaluation offered by a Certified PAPO Flight Instructor; and ▪ Must have had attended a PAPO Sponsored OSAG Training Clinic, Seminar or CD-Rom Training Module.
Qualified First Mate/Flight Technician:
▪ Must have successfully completed the on-line or written version of the OSAG Review Module. ▪ Must successfully complete an 800' swim in less than six minutes; ▪ Must meet a minimum parasailing experience requirement of: 200 actual full rotation flights, with written verification of experience, or must have successfully passed a flight training course and/or a flight master evaluation offered by a Certified PAPO Flight Instructor; and ▪ Must have had attended a PAPO Sponsored OSAG Training Clinic, Seminar or CD-Rom Training Module.

66. The government of Queensland, Australia, also has minimum crew experience requirements which are similar to PAPO's, but which does not include written or classroom type courses and examinations.

67. The PSC has proposed crew certification standards that require two weeks training by a PSC certified training facility or entity. The training will include 30 hours of instruction covering: water landing rescue; towline failure prevention; equipment failure prevention; pre-flight safety

[54] The marine casualty was reported to the Coast Guard and investigated by Marine Safety Detachment Panama City. See MISLE Incident Investigation Activity Number 2998649.

procedures; equipment evaluation and safe operating procedures; whiplash prevention; and safe operating techniques.

Applicability of Towing Vessel License Requirements:

68. Towing vessels are defined in 46 U.S.C. § 2101(40) and 33 C.F.R. § 164.70 as a commercial vessel engaged in or intending to engage in the service of pulling, pushing, or hauling alongside, or any combination of pulling, pulling or hauling alongside. Operators of commercial towing vessels have distinct license, training, qualification, and experience requirements, and commercial towing vessels were recently added by Congress to the class of vessels subject to inspection under 46 U.S.C. § 3301. This definition does not consider the object being towed as material to the statute's applicability. 33 C.F.R. § 161.2, however, limits the definition of towing vessel to any commercial vessel engaged in towing *another vessel* astern, alongside, or by pushing ahead. This definition excludes parasail vessels from being considered a commercial towing vessel. This investigation did not find any instance where the Coast Guard considered a parasail vessel to be a towing vessel, and thus regulated it as such.

69. The towing vessel definition of 46 U.S.C. § 2101(40) does not include vessels used exclusively in assistance towing (i.e., towing a disabled vessel for consideration). To be authorized to engage in assistance towing, mariners must have an assistance towing endorsement on their license as required by 46 C.F.R. § 11.482. The endorsement is required for all licenses except those for master and mate (pilot) of towing vessels and those for master or mate authorizing service on inspected vessels over 200 gross tons. Holders of any of these licenses may engage in assistance towing within the scope of the licenses and without the endorsement.

70. To obtain a towing vessel endorsement, a mariner must pass a written examination demonstrating his or her knowledge of assistance towing safety, equipment, and procedures.

71. Experience operating parasail vessels is not comparable to operating towing vessels that engage in services traditionally associated with the commercial towing vessel industry. It is, however, relatively comparable to operating a vessel that primarily provides assistance towing services to recreational boaters.[55] This investigation however, did not find any instance where the Coast Guard required an operator of a parasail vessel to have an assistance towing vessel endorsement as a condition of operation.

Fatigue:

72. The master and deckhand of the TIED HIGH were off-duty the day before the casualty, and evidence indicates that both had sufficient rest prior to coming on-duty August 28.

[55] According to the "Uninspected Towing Vessel Industry, Analysis Project, Final Report # 469-05, issued August 2006, and prepared by ABSG Consulting at the request of the Coast Guard, vessels that provide assistance towing services to recreational boaters are often less than 26 ft in length, are generally modified recreational boats, and are typically state registered. Nationwide, it is estimated that there are about 250 to 275 companies that provide assistance towing services, with somewhere between 1,200 and 1,400 vessels involved.

Conclusions

1. In accordance with reference (c) the Initiating Event (or first unwanted outcome) for this casualty was the failure of the winch to retrieve the passengers in flight during the storm and high winds.

2. The causal factors that led to this casualty are as follows:

a) Environment: There was one primary environmental causal factor.

1) The weather in this case had a constant negative impact during this casualty. The National Weather Service (NWS) reported at 1301 that showers and thunderstorms were observed producing heavy rain along a line extending from seven miles SE of Topsail Beach to six miles S of Southport and moving west at 35 mph with brief wind gusts to 30 mph. During the casualty, the wind speed ranged from 19 to 25 mph, as the outermost bands of the severe storm reached the area, and continued to increase reaching speeds estimated between 23 to 34 mph with gusts to 40 mph. As the winds increased, it eventually exceeded the pulling capacity of the winch and prevented the master from retrieving the passengers in flight. The sea height (waves) also played a major role in this casualty as it exaggerated the pitching and rolling that the TIED HIGH, the crew and passengers experienced. There is no company policy regarding the weather parameters for operating or parasailing the TIED HIGH. Decisions to operate or parasail and to continue operating or parasailing are based upon the master's discretion.

b) Personnel: There are three primary casual factors that involve human error on the part of the company owner and vessel master.

1) The failure of the company owner and vessel master to evaluate and determine if prevailing and forecasted weather conditions were favorable for parasailing.

2) The failure of the company owner and vessel master to:

a. obtain and monitor the latest marine broadcasts;

b. recognize an approaching severe weather system and take precautionary measures;

c. follow recommendations of the equipment manufacturer with regard to canopy selection and wind speeds;

d. provide a comprehensive parasailing safety brief to the passengers that included the proper procedures to be followed in a parasailing emergency; and

e. be proficient in parasailing emergency techniques and procedures.

3) The failure of the company owner to ensure that the vessel master and crew had appropriate instructions, procedures, and training to ensure safe parasail operations and to prepare for and respond to emergency situations.

c) Equipment: There are four primary casual factors that involve equipment.

1) The vessel's winch capacity was exceeded and was incapable of reeling in flying passengers where the combined vessel and wind conditions exceeded approximately 33 mph.

2) The failure of the towline to withstand extreme case parasailing conditions and the associated loads of high wind and waves.

3) The towline's rapid and significant degradation in strength while in parasailing service. Parasailing is a severe application that leads to rapid degradation and strength loss in a towline. Forensic investigation of the TIED HIGH towline indicated it had a 29% reduction in strength in 32 days. The loss of strength was due to the combined effects of cyclical tension wear, shock loading, external abrasion and flex fatigue.

4) The towline's significant reduction in strength due to the use of a bowline knot to fasten the towline to the parasail harness. Lab testing indicated that the bowline knot reduced the breaking strength of the TIED HIGH towline an additional 29% beyond that provided by the towline in its worn condition. At the time of the casualty, the average breaking strength of the TIED HIGH towline was a significant 50% below the manufacturer's minimum breaking strength.

d) Safety Standards: There are two primary casual factors that involve safety standards.

1) The lack of a basis for towline selection, inspection, and retirement (removal from service). Parasail towlines are subjected to severe and highly variable conditions, and the failure to properly use, inspect and maintain a parasail towline endangers human life.

2) The lack of training, qualification, and experience requirements that ensure vessel masters and crews are familiar with and proficient in parasailing emergency techniques and procedures.

3. There is substantial evidence that the company owner and master of the TIED HIGH, through their actions or inactions, committed acts of negligence and/or misconduct that contributed to the cause of this casualty and the death of two passengers. The master failed to consider the significant danger of engaging in parasailing operations near and around a weather frontal system that had been forecasted by NWS Wilmington, observed and broadcasted via a Special Weather Statement on 162.550 megahertz (i.e. NOAA weather channel one) by NWS Wilmington at 1301 on August 28, 2009.

4. There is no evidence that the use of dangerous drugs or alcohol contributed to this casualty.

5. With the above exceptions, the investigation did not identify any inconsistencies with regards to the vessel's Coast Guard inspection. It was determined the vessel was in substantial compliance with 46 C.F.R. Subchapter T on the day of the casualty.

6. With the above exceptions, the investigation did not identify any inconsistencies with regards to the parasail equipment onboard the TIED HIGH. It was determined the parasail equipment in

use at the time of the casualty was in good working order in accordance with manufacture or industry standards.

7. There is no evidence that work/rest related issues contributed to this casualty.

8. There is no evidence that any act of misconduct, incompetence, negligence, lack of professionalism, and/or willful violation of law committed by any officer, employee, or member of the Coast Guard contributed to this casualty.

Recommendations

Safety:

1. It is recommended that the Commandant of the Coast Guard, in consultation with national parasailing organizations and/or the parasailing industry, establish distinct license, training, qualification, and experience requirements that apply to operators and crew of commercial parasail vessels.

2. It is recommended that the Commandant of the Coast Guard require owners and operators of commercial parasail vessels to conduct a written assessment of all the risks it foresees could arise in conducting parasailing, and to prepare a written contingency plan approved by the local OCMI for eliminating, minimizing or responding to the risks.

3. It is recommended that the Commandant of the Coast Guard require owners and operators of commercial parasail vessels to conduct sufficient training, drills and exercises to ensure that crewmembers are proficient in parasailing emergency techniques and procedures. Training, drills and exercises shall be logged or otherwise documented for review by the Coast Guard upon request. Drills and exercises must test the proficiency of company and vessel personnel in assigned emergency response duties.

4. It is recommended that the Commandant of the Coast Guard require parasail vessels to have emergency instructions onboard and readily available to the master and crew to include at least the following parasailing contingencies: unintended landing on water; winch malfunction; towline failure; and propulsion machinery failure with a passenger in flight.

5. It is recommended that the Commandant of the Coast Guard, in consultation with national parasailing organizations and/or the parasailing industry, develop parasail towline selection, inspection and retirement (removal from service) guidelines. These guidelines should require records to be kept that indicate the size, fiber, construction, length, manufacturer, minimum breaking strength, safe working load, date placed in service, and inspection interval for each towline. Inspections should be logged and should check for damage, wear and include caliper measurements of the towline diameter to determine if the towline has deteriorated. The master of the parasailing vessel should be responsible for keeping these records and reporting the same to management. For each towline, the records should be kept for the duration of its service life and should be made available for review by the Coast Guard upon request. When developing the guidelines, the Coast Guard should further evaluate: the need to conduct additional operational tests to determine a towline's required minimum breaking strength; the need to require the breaking strength of each towline to be certified by the manufacturer by subjecting a portion of

the rope to destructive testing prior to its installation; and the need to specify the use of more efficient connections (e.g., eye splices, thimbles, etc.) between the towline and the yoke.

6. It is recommended that the Commandant of the Coast Guard require the operator of a commercial parasail vessel to record for each flight: the parasail canopy used and its operational limitations; the estimated weight of the passenger(s); the prevailing wind and sea state; the duration of the flight; and the details of any parasailing incident that occurred during the flight. The master of the parasailing vessel should be responsible for keeping these records and reporting the same to management. For each towline, the records should be kept for the duration of its service life and should be made available for review by the Coast Guard upon request.

7. It is recommended that the Commandant of the Coast Guard, in consultation with national parasailing organizations and/or the parasailing industry, develop operational readiness, maintenance, and inspection requirements for winches used to deploy and recover passengers while parasailing. When developing the inspection requirements, the Coast Guard should develop minimum power ratings and further evaluate the need for redundant or emergency winch systems that could be used should the primary winch fail.

8. It is recommended that the Commandant of the Coast Guard require the inspection of the parasail gear and equipment, as necessary to determine that the gear and equipment are in good working order and fit for the service intended, before the issuance of a Certificate of Inspection to any vessel that engages in commercial parasailing.

9. It is recommended that the Commandant of the Coast Guard, in consultation with national parasailing organizations and/or the parasailing industry, define the necessary route and operational limits for safe parasailing, and direct cognizant Officers in Charge, Marine Inspection, to record these route and operational limits on the Certificate of Inspection of commercial parasail vessels.

10. It is recommended that the Commandant of the Coast Guard require owners and operators of commercial parasail vessels to provide a comprehensive passenger safety briefing prior to departure to include a discussion of the inherent risks of parasailing, the route and operational limits imposed to mitigate these risks, and the proper procedures to be followed during the course a parasailing emergencies to include: unintended landing on water; winch malfunction; towline failure; and propulsion machinery failure with a passenger in flight.

11. It is recommended that the Commandant of the Coast Guard require commercial parasail operators to monitor marine broadcasts prior to conducting and while engaged in parasailing, and to obtain and monitor wind speed and direction in order to evaluate the advisability of launching passenger(s) in flight, or continuing with a flight when conditions progressively deteriorate.

12. It is recommended that the Commandant of the Coast Guard, in consultation with national parasailing organizations and/or the parasailing industry, review, modify, and ultimately adopt and incorporate by reference in 46 C.F.R. Subchapter T, the Professional Association of Parasail Operators Operating Standards and Guidelines, or a similarly produced and recognized industry standard. Where industry has not established suitable safety requirements addressing the causes of this casualty, the Coast Guard should provide the leadership and catalyze their development. These actions will allow the Coast Guard to capitalize on standards that are already familiar to

the parasailing industry and will raise the level of safety provided to the level expected by the American public. Further, it will minimize the burdens on the parasailing industry associated with variations in safety standards imposed by various jurisdictions.

13. It is recommended that the Commandant of the Coast Guard seek legislative authority to inspect parasail vessels that carry at least one passenger for hire and enact implementing regulations. This action when taken in concert with this report's other recommended actions will result in a regulatory regime that provides a set of minimum safety standards for commercial parasailing on U.S. navigable waters, and will result in lives saved.

14. It is recommended that the Commandant of the Coast Guard provide written guidance to marine inspectors to be used during the inspection and certification of commercial parasail vessels. This guidance should be taught at the Marine Inspection and Investigation School at Training Center Yorktown and be made available to the public and parasailing industry.

15. It is recommended that the Commandant of the Coast Guard provide written guidance to marine investigators to be used during the investigation of parasailing marine casualties. This guidance should be taught at the Marine Inspection and Investigation School at Training Center Yorktown and be made available to the public and parasailing industry.

16. It is recommended that the Commandant of the Coast Guard provide notice to the parasailing industry that failures of parasailing equipment to include the winch, towline, harness, and parasail, are considered to be occurrences that materially and adversely affect a vessel's fitness for service, and are considered reportable marine casualties under 46 USC §6101 and its implementing regulations of 46 C.F.R. §§ 4.05-1(a)(4) and 185.202(a)(4).

17. It is recommended that the Commandant of the Coast Guard implement the Voluntary Commercial Parasailing Vessel Safety Examination program instituted by Coast Guard Sector St. Petersburg throughout the Coast Guard until this report's other recommended actions can be fully enacted. This interim measure will enhance, improve, and increase Coast Guard interactions with the parasailing vessel industry and promote the voluntary compliance with industry best practices.

18. It is recommended that the Commandant of the Coast Guard provide a copy of this report to the following entities:

a. Area, District, and Sector Commanders;
b. Estates of the deceased;
c. Parties in interest;
d. Professional Association of Parasail Operators;
e. Parasail Safety Council;
f. Passenger Vessel Association;
g. Water Sports Industry Association;
h. Yale Cordage, Inc.;
i. North Carolina Wildlife Resources Commission;
j. Mayor, City of Wilmington, NC; and
k. Mayor, City of Ocean Isle Beach, NC
l. The National Transportation Safety Board

Enforcement

1. It is recommended that the Commander of the Fifth Coast Guard District forward this case to the U.S. Attorney General for review for possible criminal liability of the company owner and master of the TIED HIGH under 18 U.S. C. § 1115, 46 U.S.C. § 2302(a), and other laws, as per 46 C.F.R. § 4.23-1.

2. It is recommended that Sector Delaware Bay, which exercises OCMI authority closest to Captain [redacted] home of record, initiate administrative suspension and revocation actions against the license of the master of the TIED HIGH for misconduct and/or negligence under 46 U.S.C. § 7703(1).

3. It is recommended that Marine Safety Unit Wilmington, which exercises OCMI authority closest to the owner of the TIED HIGH, initiate civil penalty action against the company owner and vessel master for operating the TIED HIGH in a negligent manner that endangered life, limb or property of a person.

Other:

1. This casualty investigation should be closed.

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Encl: NTSB Office of Research and Engineering, Materials Laboratory Division, Materials Laboratory Factual Report No. 10-040, dated June 14, 2010