Appendix D

USCG Investigation Report
Report of Investigation into the Circumstances Surrounding the Incident Involving S/V Cynthia Woods/ Capsize/Galveston Area A-54

On 06/06/2008
I. INCIDENT BRIEF

On 06 June 2008, the Sailing Vessel CYNTHIA WOODS (TX9232AC) departed Galveston, Texas en route to Vence, Mexico while competing in the Regatta de Amigos sailboat race. Two safety officers employed by Texas A&M University at Galveston and four student crew members were onboard. At approximately 2330 on 06 June 2008, approximately 27 miles south of Freeport, Texas, the vessel suffered a catastrophic loss of its keel.

The keel and approximately a 1" area of the hull surrounding the keel separated from the vessel and sank to the ocean floor. The loss of the vessel's keel caused an immediate 90 degree starboard roll of the vessel. Subsequently the vessel rolled another 90 degrees, capsizing. Three members of the vessel's crew (one safety officer and two student crew members) were immediately thrown into the water. Three other members of the vessel's crew (one safety officer and two student crew members), who had been sleeping below deck, were trapped in the vessel's cabin. The safety officer assisted the students egress from the cabin, but was unable to extricate himself from the cabin.

Approximately 26 hours after the vessel capsized, one safety officer and four students were rescued by a Coast Guard helicopter. The sailboat continued to remain afloat while capsized. On 08 June 2008, a salvage crew recovered the body of the other safety officer from the vessel's cabin. During this evolution, the vessel's life raft was found within the cabin. On 10 June 2008, the CYNTHIA WOODS was towed to Freeport, Texas. The vessel was subsequently removed from the water. An inventory of the vessel's contents revealed that the EPIRB was stored within the cabin of the CYNTHIA WOODS. Marine Surveyors deemed the vessel a total constructive loss.
II. EXECUTIVE SUMMARY

Incident Summary

On 06 June 2008, the Sailing Vessel CYNTHIA WOODS (TX9232AC) departed Galveston, Texas on route to Veracruz, Mexico while competing in the Regatta de Amigos sailboat race. Two safety officers employed by Texas A&M University at Galveston and four student crewmembers were onboard. At approximately 2330 on 06 June 2008, approximately 27 miles south of Freeport, Texas, the vessel suffered a catastrophic loss of its keel.

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Incident Involved: Marine Casualty, Non-Reportable

Level of Investigation: Informal
IMO Classification: Routine
USCG Classification: Routine
Was this a Serious Marine Incident? No
Was a Marine Board Convened by Commandant? No

Personnel Casualty Summary

Total Missing = 0
Total Dead = 1
Total Injured = 0
Total at Risk, Not Injured = 5
Total People at Risk = 6
Other Personnel (Not at Risk) = 0

Vessel(s) Status Summary
Report of Investigation

Actual Total Loss(es) = 0
Total Constructive Loss, Salvaged = 1
Total Constructive Loss, Unsalvaged = 0
Damaged = 0
Undamaged = 0

Property Damage Summary/Total Damage

Vessel(s) = $360000*
Cargo = $
Facility(s) = $
Other = $

* Includes estimates

Waterway Mobility Summary

Vessel Delays (including speed restrictions): None
III. ACTIONS IN RESPONSE TO THIS REPORT

Actions on Recommendations

Safety Alerts
IV. FINDINGS OF FACT

Subjects of the Investigation

Vessels. The following vessels were subjects of this investigation. Particulars for each vessel follow.

Vessel Name: CYNTHIA WOODS
Flag: TX9232AC
Vessel Identification Number:
Call Sign:
Status: Total Constructive Loss: Salvaged
Role: Involved in a Marine Casualty
Vessel Class, Type, Sub-Type: Recreational, Sailing Vessels, Sloop
Gross Tonnage(GRT):
Net Tonnage(NRT):
Deadweight Tons:
Length: 38
Home/Hailing Port: GALVESTON, TX
Keel Laid Date: 11/18/2005
Delivery Date: 12/13/2005
Place of Construction: Wilmington, NC, UNITED STATES
Builder Name: CAPE FEAR YACHT WORKS
Propulsion: Sail
Horsepower: 29
Master:
Classification Society:
Owner: TEXAS A&M University at Galveston
GALVESTON, TX, 77554
US
Operator:
Inspection Subchapter:
Most Recent Vessel Inspection Activity:

Facilities. The following facilities were subjects of this investigation. Particulars for each facility follow.

Parties and Organizations. The following people and organizations were subjects of this investigation.

Status: Not at Risk
Role: Subject of Investigation
Gender:
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<td>Address(Home/Primary Residence):</td>
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Comments:
Report of Investigation

Comments:

Status: Not at Risk
Role: Witness
Gender: 
Age: 
SSN: 
Birth Date: 
Email Address: 
Phone Number(): 
Address(): 
Comments: 

Nickname is [redacted]

Status: Not at Risk
Role: Witness
Gender: 
Age: 
SSN: 
Birth Date: 
Email Address: 
Phone Number(): 
Address(): 
Comments: 

Student Affairs and Administration

Status: Not at Risk
Role: Witness
Gender: 
Age: 
SSN: 
Birth Date: 
Email Address: 
Phone Number(): 
Address(): 
Comments: 

[redacted] of Dark Water Diver

Status: Not at Risk
Role: Witness
Gender: 
Age: 
SSN: 
Birth Date: 
Email Address: 

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Phone Number:
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Comments:

Status:
Role:
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SSN:
Birth Date:
Email Address:
Phone Number:
Address:
Comments:

Not at Risk
Witness
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Status:
Role:
Gender:
Age:
SSN:
Birth Date:
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Address:
Comments:

Not at Risk
Witness

Status:
Role:
Gender:
Age:
SSN:
Birth Date:
Email Address:
Phone Number:
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Comments:

At Risk, Not Injured
Subject of Investigation
M

University at Galveston Employee

of Diving Operations for
T&T Marine Salvage Company

Technician at Texas A&M
University at Galveston
Report of Investigation

Comments:

Status: Not at Risk
Role: Witness
Gender:
Age:
SSN:
Birth Date:
Email Address:
Phone Number:
Address:
Comments:

Former student at Texas A&M
University at Galveston

STONE, ROGER WINSLOW
Status: Dead
Role: Subject of Investigation
Gender:
Age:
SSN:
Birth Date:
Email Address:
Phone Number:
Address:
Comments:

Safety Officer working for Texas
A&M University at Galveston

Not at Risk
Witness

Donated photographs.

At Risk, Not Injured
Subject of Investigation
M
Report of Investigation

Birth Date:
Email Address:
Phone Number(Daytime Phone):
Address(Primary):

Comments:

GALVESTON YACHT SERVICE INC
Status:
Role:
Email Address:
Phone Number():
Address(Primary Place of Business):

Not at Risk
Subject of Investigation
7TH & WHARF STREETS
P.O. BOX 385
GALVESTON, TX 77553

Comments:

PAYCO INC
Status:
Role:
Email Address:
Phone Number():
Address(Primary Place of Business):

Not at Risk
Other
501 BLUME DRIVE
GALVESTON, TX 77554

Comments:

TEXAS A & M UNIVERSITY AT GALVESTON
Status:
Role:
Email Address:
Phone Number():
Address(Mailing):
P.O. Box 1675
Galveston, TX 77553-1675
US

Comments:

Response Resources. The following incident response resources were subjects of this investigation.

Resource Name: C130J Air Station Elizabeth City
Resource ID: 
Kind: Aircraft (Fixed Wing)
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Report of Investigation

Sub-Kind:
Type:

Other Subjects. The following were subjects of this investigation.

Waterway Segment(s). The following waterway segment(s) were subjects of this investigation.

GALVESTON CHANNEL
Role: Location
Local Name: GALVESTON CHANNEL
Description:

GALVESTON OUTER BAR CHANNEL
Role: Location
Local Name: BUOY "7A"
Description:

GULF DEEP WATER SPINE
Role: Location
Local Name: Segment #11
Description: GULF OF MEXICO. GULF DEEP WATER SEA-LANE.

PAYCO MARINA TRANSIT ROUTE
Role: Location
Local Name: PAYCO MARINA
Description: Entrance of PAYCO Marina to the Intra-Coastal Waterway.

TEXAS A&M SMALL BOAT BASIN
Role: Location
Local Name: TEXAS A&M SMALL BOAT BASIN
Description: Small boat docks for Texas A&M vessels.

Incident Information

Location(s).

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<tr>
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<td>28 29.38 N</td>
<td>094 58.686 W</td>
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<tr>
<td>TEXAS A&amp;M SMALL BOAT BASIN</td>
<td>29 18.0 N</td>
<td>094 49.0 W</td>
</tr>
<tr>
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<td>29 20.5 N</td>
<td>094 43.0 W</td>
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<td>GALVESTON YACHT SERVICES MARINA</td>
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Report of Investigation

Sequence of Events.

03/21/2002 0:00:00 to 03/21/2002 0:00:01 (Estimated): 38' Cape Fear Regatta Version was designed by [Redacted].

Condition Class: Vessel, Facility, Equipment, Gear, or Cargo
Condition Type: Vessel Material/Equipment Condition
Subject Type: Construction/Loadline
Location: Unknown

Subject(s) and Details:

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<td>CYNTHIA WOODS</td>
<td>Vessel</td>
<td>Total Constructive</td>
<td>Involved in a Marine Casualty</td>
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Details Filed: Detail Description

[Redacted] P.E. of Merck Yacht Design, Wilmington, North Carolina designed the Cape Fear 38' Regatta Version sailboat. The vessel was licensed to be built by Cape Fear Yacht Works, Wilmington, North Carolina.

11/01/2005 0:00:01 to 06/06/2008 0:00:00 (Estimated): Hull and draft dimensions of the S/V Cynthia Woods. Draft is 7'-2", length is 38'.

Condition Class: Vessel, Facility, Equipment, Gear, or Cargo
Condition Type: Vessel Material/Equipment Condition
Subject Type: Construction/Loadline
Location: Known; US Waters
Description: CAPE FEAR YACHT WORKS WILMINGTON, NC
Latitude: 34 26.0 N   Longitude: 077 59.0 W

Subject(s) and Details:

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Status</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYNTHIA WOODS</td>
<td>Vessel</td>
<td>Total Constructive</td>
<td>Involved in a Marine Casualty</td>
</tr>
</tbody>
</table>

Details Filed: Detail Description

Cape Fear 38 Regatta Version approximate hull dimensions: LOA (Hull) 37.74', LWL 34', Beam 11', Draft (6'keel) 7'-2", Displacement 10,000 Lbs, Ballast 4650 Lbs.

11/17/2005 0:00:00 to 11/17/2005 0:00:00 (Known): S/V Cynthia Woods constructed by Cape Fear Yachts.

Condition Class: Vessel, Facility, Equipment, Gear, or Cargo
Condition Type: Vessel Material/Equipment Condition
Subject Type: Construction/Loadline
Location: Known; US Waters
Description: CAPE FEAR YACHT WORKS WILMINGTON, NC
Latitude: 34 26.0 N   Longitude: 077 59.0 W
## Report of Investigation

### Subject(s) and Details:

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<td>Vessel</td>
<td>Total Constructive Loss: Salvaged</td>
<td>Involved in a Marine Casualty</td>
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</tbody>
</table>

Details Filed: Detail Description
Manufacturer's statement of origin designates the S/V Cynthia Woods as vessel CF38200507 5238 UAR380071305.

11/18/2005 00:00 to 06/18/2008 00:00 (Known): S/V Cynthia Woods delivered by the manufacturer to PAYCO Inc. for final assembly.

Condition Class: Vessel, Facility, Equipment, Gear, or Cargo
Condition Type: Vessel Material/Equipment Condition
Subject Type: Construction/Loadline
Location: Known; On Land
Description: PAYCO MARINA 501 BLUME DRIVE, GALVESTON, TX
Latitude: 29° 17.0' N  Longitude: 094° 52.0' W

### Subject(s) and Details:

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Details Filed: Detail Description
PAYCO Inc. was contracted by Texas A&M University to remove the S/V Cynthia Woods from its shipping trailer and ready it for operation. PAYCO Inc. charged for the following services: cleaning of hull, stepping of mast, assembly of handrails, installation of rudder, connection of rudder linkage, and setting the keel into the hull.

01/04/2006 00:00 to 03/08/2006 00:00 (Estimated): Depth of water at PAYCO Marina is reported by Texas A&M school officials as 5' except for extra high tide.

Condition Class: Marine Environment
Condition Type: Waterway Condition
Subject Type: 
Location: Known; On Land
Description: PAYCO MARINA 501 BLUME DRIVE, GALVESTON, TX
Latitude: 29° 17.0' N  Longitude: 094° 52.0' W

### Subject(s) and Details:

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<tbody>
<tr>
<td>PAYCO MARINA</td>
<td>Waterway</td>
<td>Location</td>
<td></td>
</tr>
<tr>
<td>TRANSIT ROUTE</td>
<td>Waterway</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Details Filed: Waterway Condition

**Waterway Characteristics**

- **Waterway Description:**
- **Approach Constriction:** Open
- **Constriction Description:** Channel is not deep enough to allow transit of a vessel 7-2' without an extremely high tide.

---

16
Report of Investigation

Narrow Channel: No
Anchorage: No
Fleeting Area: No
Visibility Obstructions: No
Shoreline Congestion: No
Channel Crossing: No
Bridges: No
Number of Turns: No
Blind Turns: No
Ferry Crossings: No
Junctions: No

Aids to Navigation (ATON)
Was ATON involved in any way: No
Latent Unsafe Condition: Yes

02/22/2006 0:00:00 to 02/22/2006 0:00:00 (Estimated): Vessel en route from PAYCO Marina to Texas A&M University with [REDACTED] operating the vessel.

Condition Class: Operations Status
Condition Type: Vessel Operation Status
Subject Type:
Location: Known; US Waters
Description: PAYCO MARINA TRANSIT ROUTE
Latitude: 29 17.0 N  Longitude: 094 52.0 W

Subject(s) and Details:

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<td>Total Constructive Loss: Salvaged</td>
<td>Involved in a Marine Casualty</td>
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</tbody>
</table>

Details Filed: None

02/22/2006 0:00:01 to 02/22/2008 0:00:02 (Estimated): [REDACTED] grounded the S/V Cynthia Woods while inside PAYCO Marina in Galveston, Texas. Vessel Log for Cynthia Woods was lost at sea, date is uncertain, approximately 2-3 weeks before 08MAR06.

Event Type: Grounding
Event Class: In marked channel
Event Subclass: Full Control
Location: Known; US Waters
Description: PAYCO MARINA TRANSIT ROUTE
Latitude: 29 17.0 N  Longitude: 094 52.0 W

Subject(s) and Details:

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<tr>
<td>CYNTHIA WOODS</td>
<td>Vessel</td>
<td>Total Constructive Loss: Salvaged</td>
<td>Involved in a Marine Casualty</td>
</tr>
</tbody>
</table>

Details Filed: Grounding Details

Type of Grounding: Hard
Type of Bottom: Mud
Depth of Water:
Report of Investigation

<table>
<thead>
<tr>
<th>Charted:</th>
<th>Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual:</td>
<td>Feet</td>
</tr>
<tr>
<td>Recorded:</td>
<td></td>
</tr>
<tr>
<td>Part of Vessel Aground:</td>
<td>Centerline Midships</td>
</tr>
<tr>
<td>Vessel Course:</td>
<td>True</td>
</tr>
<tr>
<td>Vessel Speed:</td>
<td>Knots</td>
</tr>
<tr>
<td>Steering Functional:</td>
<td>Fully</td>
</tr>
<tr>
<td>Propulsion Functional:</td>
<td>Fully</td>
</tr>
<tr>
<td>Hazard to Navigation:</td>
<td>No</td>
</tr>
<tr>
<td>ATRAN Survey Required:</td>
<td>No</td>
</tr>
<tr>
<td>Fuel On Board:</td>
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<tr>
<td>Cargo On Board:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cargo Name</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sailing Vessel grounded on its keel</td>
</tr>
</tbody>
</table>

02/22/2006 0:00:02 to 02/22/2006 0:00:03 (Estimated): [Redacted] requested to have the M/V Roamin' Empire tow the S/V Cynthia Woods from PAYCO Marina. The sailboat keel was dragged approximately 100 yards across the bottom before the vessel was returned to the dock.

Action Type: Bridge Operations - Shiphandling
Action Class: Manage and coordinate assist vessels
Location: Known; US Waters
Description: PAYCO MARINA TRANSIT ROUTE
Latitude: 29 17.0 N Longitude: 094 52.0 W

Subject(s) and Details:

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<th>Name</th>
<th>Type</th>
<th>Status</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Redacted]</td>
<td>Party</td>
<td>Not at Risk</td>
<td>Subject of Investigation</td>
</tr>
</tbody>
</table>

Details Filed: None
PAYCO MARINA
TRANSIT ROUTE
Details Filed: None

03/08/2006 0:00:00 to 06/06/2008 0:00:00 (Known): Vessel en route from PAYCO Marina to Texas A&M University with [Redacted] operating the vessel.

Condition Class: Operations Status
Condition Type: Vessel Operation Status
Subject Type:
Location: Known; US Waters
Description: PAYCO MARINA TRANSIT ROUTE
Latitude: 29 17.0 N Longitude: 094 52.0 W

Subject(s) and Details:

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<tr>
<td>CYNTHIA WOODS</td>
<td>Vessel</td>
<td>Total Constructive Loss: Salvaged</td>
<td>Involved in a Marine Casualty</td>
</tr>
</tbody>
</table>
Report of Investigation

Details Filed: None

03/08/2006 8:00:00 to 03/08/2006 16:00:00 (Estimated): [redacted] grounded the S/V Cynthia Woods at the entrance to PAYCO Marina.

Event Type: Grounding
Event Class: In marked channel
Event Subclass: Full Control
Location: Unknown

Subject(s) and Details:

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<td>Vessel</td>
<td>Total Constructive Loss: Salvaged</td>
<td>Involved in a Marine Casualty</td>
</tr>
</tbody>
</table>

Details Filed: Grounding Details

- Type of Grounding: Hard
- Type of Bottom: Mud
- Depth of Water:
  - Charted: Feet
  - Actual: 5 Feet
  - Recorded: Feet
- Part of Vessel Aground: Centerline Midships
- Vessel Course: True
- Vessel Speed: Knots
- Steering Functional: Fully
- Propulsion Functional: Fully
- Hazard to Navigation: No
- ATON Survey Required: No
- Fuel On Board: [redacted]
- Cargo On Board: [redacted]

Additional Information: Sailboat grounded on the keel

03/08/2006 8:01:00 to 06/06/2008 16:00:00 (Estimated): S/V Cynthia Woods was towed by the M/V ROAMIN' EMPIRE from PAYCO Marina to the entrance of the ICW. The vessel's keel was dragged along the bottom during the towing evolution.

Action Type: Bridge Operations - Shiphandling
Action Class: Manage and coordinate assist vessels
Location: Unknown

Subject(s) and Details:

Name: [redacted]

Type: Party
Status: Not at Risk
Role: Subject of Investigation

Details Filed: Detail Description

[redacted] requested [redacted] use the M/V ROAMIN' EMPIRE to tow the S/V Cynthia Woods from PAYCO Marina. A tow line was attached to the bow of the S/V Cynthia Woods in the marina and the M/V ROAMIN' EMPIRE pulled the sailboat through the narrow channel. During the towing operation, the keel was in contact with the bottom. Approximately halfway through the towing operation, the sailboat became stuck in the muddy bottom. A third
vessel was requested to assist with the tow. The third vessel tied a rope to the mast and pulled the
cessel to starboard to pull the keel out of the mud. Once free the vessel was assisted to the Intra-
Coastal Waterway where it motored under its own power to Texas A&M University's small boat
basin.

03/09/2006 0:00:00 to 06/06/2008 0:00:00 (Estimated): S/V Cynthia Woods is moored at the
Texas A&M Small Boat Marina when not in operation.

Condition Class: Operations Status
Condition Type: Vessel Operation Status
Subject Type:
Location: Known; US Waters
Description: TEXAS A&M SMALL BOAT BASIN
Latitude: 29 18.0 N  Longitude: 094 49.0 W

Subject(s) and Details:

Name: CYNTHIA WOODS  Type: Vessel  Status: Total Constructive Loss: Salvaged
Role: Involved in a Marine Casualty

Details Filed: None

03/09/2006 0:00:01 to 06/06/2008 0:00:00 (Known): S/V Cynthia Woods grounded inside the
Texas A&M Small Boat Marina every time the semidiurnal tide was less than 7'-2" in the
marina.

Event Type: Grounding
Event Class: Outside marked channel
Event Subclass:
Location: Known; US Waters
Description: TEXAS A&M SMALL BOAT BASIN
Latitude: 29 18.0 N  Longitude: 094 49.0 W

Subject(s) and Details:

Name: CYNTHIA WOODS  Type: Vessel  Status: Total Constructive Loss: Salvaged
Role: Involved in a Marine Casualty

Details Filed: Grounding Details
Type of Grounding: Soft
Type of Bottom: Feet
Depth of Water:
Charted: Feet
Actual: Feet
Recorded: Feet
Part of Vessel Aground: True
Vessel Course: Knots
Vessel Speed: Fully
Steering Functional: Fully
Propulsion Functional: No
Hazard to Navigation: No
ATON Survey Required: No
Fuel On Board:
Report of Investigation

Cargo On Board:

Cargo Name: Quantity

Additional Information:

03/09/2006 0:00:03 to 06/06/2008 0:00:00 (Estimated): No actions were taken to alleviate the stress placed on the vessel's keel and hull. The stress occurred when the vessel grounded during the semidiurnal tidal cycle.

Action Type: Shore Activities - Set Operating Policy
Action Class: Issue Special Instructions
Location: Known; US Waters
Description: TEXAS A&M SMALL BOAT BASIN
Latitude: 29 18.0 N Longitude: 094 49.0 W

Subject(s) and Details:

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</thead>
<tbody>
<tr>
<td></td>
<td>Party</td>
<td>Not at Risk</td>
<td>Witness</td>
</tr>
<tr>
<td></td>
<td>Party</td>
<td>Not at Risk</td>
<td>Subject of Investigation</td>
</tr>
</tbody>
</table>

Details Filed: None

07/08/2006 0:00:00 to 07/08/2006 0:00:00 (Known): reports the tides are 2.5 feet below normal for this time of year.

Condition Class: Marine Environment
Condition Type: Waterway Condition
Subject Type: Known; US Waters
Description: GALVESTON OUTER BAR CHANNEL
Latitude: 29 20.5 N Longitude: 094 43.0 W

Subject(s) and Details:

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<tbody>
<tr>
<td>GALVESTON OUTER</td>
<td>Waterway</td>
<td></td>
<td>Location</td>
</tr>
<tr>
<td>BAR CHANNEL</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Details Filed: None

07/08/2006 7:00:00 to 07/08/2006 15:50:00 (Estimated): S/V Cynthia Woods departs Texas A&M University Marina with 5 person onboard for an offshore cruise. is operating the vessel.

Condition Class: Operations Status
Condition Type: Vessel Operation Status
Subject Type: Known; US Waters
Description: GALVESTON OUTER BAR CHANNEL
Latitude: 29 20.5 N Longitude: 094 43.0 W
Report of Investigation

Subject(s) and Details:

Name: CYNTHIA WOODS  Type: Vessel  Status: Total Constructive Loss: Salvaged  Role: Involved in a Marine Casualty

Details Filed: None

07/08/2006 15:00:00 to 07/08/2006 18:50:00 (Known): S/V Cynthia Woods grounded approximately 1/2 a mile from buoy #9 while inbound to the Port of Galveston.

Event Type: Grounding  Event Class: In marked channel  Event Subclass: Full Control  Location: Known; US Waters

Description: GALVESTON OUTER BAR CHANNEL  Latitude: 29° 20.5' N  Longitude: 094° 43.0' W

Subject(s) and Details:

Name: CYNTHIA WOODS  Type: Vessel  Status: Total Constructive Loss: Salvaged  Role: Involved in a Marine Casualty

Details Filed: Detail Description

The S/V Cynthia Woods completed an offshore excursion and was inbound to the Port of Galveston when it grounded. The vessel entered the Galveston Jetty leaving Marker 5A to starboard and the vessel proceeded to Marker 7. Approximately 100 yards south of Marker 7, the S/V Cynthia Woods turned west to a heading of 270 degrees on an inbound course for the Port of Galveston. The vessel ran aground approximately 1/2 mile south of Marker 9.

Details Filed: Grounding Details

Type of Grounding: Hard  Type of Bottom: Depth of Water:


Additional Information:

07/08/2006 15:01:00 to 07/08/2006 18:50:00 (Estimated): [Redacted] attempted to power through the shoaled area that he was grounded on with negative results. The vessel was freed from the sandbar with two assist vessels.

Action Type: Bridge Operations - Shiphandling
Report of Investigation

Action Class: Maneuver in accordance with sea/river/weather conditions
Location: Known, US Waters
Description: GALVESTON OUTER BAR CHANNEL
Latitude: 29 20.5 N  Longitude: 094 43.0 W

Subject(s) and Details:
Name:               Type:     Status:        Role:
[Redacted]          Party:   Not at Risk:    Subject of Investigation

Details Filed: Detail Description
[Redacted] attempted to proceed forward across the sandbar after the grounding. After several attempts that further embedded the S/V CYNTHIA WOODS, he requested an assisting vessel from the university. The Texas A&M Research Vessel Parker arrived on scene and made several attempts to dislodge the vessel and only succeeded after a private power boat owner stopped and assisted. The vessel was aground for approximately two hours before being freed from the sandbar.

02/11/2007 0:00:01 to 02/11/2007 0:00:02 (Estimated): Subject vessel underway for sailing practice.

Condition Class: Operations Status
Condition Type: Vessel Operation Status
Subject Type:
Location: Known, US Waters
Description: TEXAS A&M SMALL BOAT BASIN
Latitude: 29 18.0 N  Longitude: 094 49.0 W

Subject(s) and Details:
Name: CYNTHIA WOODS  Type: Vessel
Status: Total Constructive Loss: Salvaged
Role: Involved in a Marine Casualty

Details Filed: Vessel Activity Details
Vessel Activity Type: Underway
Course: True
Speed: Knots
Activity Description:
Permit Required: No
Latent Unsafe Condition: No

02/11/2007 0:00:03 to 02/11/2007 0:00:05 (Known): Subject vessel grounded on an underwater obstruction at the small boat marina entrance.

Event Type: Grounding
Event Class: In marked channel
Event Subclass: Full Control
Location: Known, US Waters
Description: TEXAS A&M SMALL BOAT BASIN
Latitude: 29 18.0 N  Longitude: 094 49.0 W

Subject(s) and Details:
## Report of Investigation

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<td>Total Constructive Loss: Salvaged</td>
<td>Involved in a Marine Casualty</td>
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### Details Filed: Grounding Details

- **Type of Grounding:** Hard
- **Type of Bottom:** Mud
- **Depth of Water:**
  - **Charted:** Feet
  - **Actual:** Feet
  - **Recorded:** Feet
- **Part of Vessel Aground:** Centerline Midships
- **Vessel Course:** True
- **Vessel Speed:** Knots
- **Steering Functional:** Fully
- **Propulsion Functional:** Fully
- **Hazard to Navigation:** No
- **AIDC Survey Required:** No
- **Fuel On Board:**
- **Cargo On Board:**

### Cargo Name: Keel struck concrete block in marked channel

02/14/2007 0:00:00 to 02/14/2007 0:00:01 (Known): Dark Water Divers hired by [Redacted] to clean the hull, report on paint condition, algae growth, barnacle growth, blisters, and any zinc replacement requirements.

- **Condition Class:** Policy, Procedures, or Regulations
- **Condition Type:** Policy, Regs, and Procedures Condition
- **Subject Type:** Procedure
- **Location:** Known; US Waters
  - **Description:** TEXAS A&M SMALL BOAT BASIN
  - **Latitude:** 29°18.0' N
  - **Longitude:** 094°49.0' W

### Subject(s) and Details:

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<td>Total Constructive Loss: Salvaged</td>
<td>Involved in a Marine Casualty</td>
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</table>

### Details Filed: Detail Description

The Dark Water Dive report noted the following: "Very bottom of keel stuck in mud". This report was given to [Redacted] who forwarded it to [Redacted] for payment.

02/14/2007 0:00:01 to 02/14/2007 0:00:02 (Known): Vessel grounding was reported by Dark Water Diver employee to [Redacted] in the form of a dive report for the vessel.

- **Event Type:** Grounding
- **Event Class:** Unmarked Waterway
- **Event Subclass:** No Control
Report of Investigation

Location: Known, US Waters
Description: TEXAS A&M SMALL BOAT BASIN
Latitude: 29 18.0 N    Longitude: 094 49.0 W

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<td>Vessel</td>
<td>Total Constructive Loss: Salvaged</td>
<td>Involved in a Marine Casualty</td>
</tr>
</tbody>
</table>

Details Filed: Grounding Details

Type of Grounding: Soft
Type of Bottom: Mud
Depth of Water:
- Charted: Feet
- Actual: Feet
- Recorded: Feet
Port of Vessel Aground: Centerline Midships
Vessel Course: True
Vessel Speed: Knots
Steering Functional: Full
Propulsion Functional: Full
Hazard to Navigation: No
ATON Survey Required: No
Fuel On Board: Yes
Cargo On Board:

<table>
<thead>
<tr>
<th>Cargo Name</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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</tbody>
</table>

Vessel stuck in mud at mooring.

02/14/2007 0:00:03 to 02/14/2007 0:00:04 (Estimated): No actions were taken to mitigate the hazard of the vessel grounding during the normal semidiurnal tidal cycles.

Action Type: Shore Activities - Set Operating Policy
Action Class: Issue Special Instructions
Location: Known, US Waters
Description: TEXAS A&M SMALL BOAT BASIN
Latitude: 29 18.0 N    Longitude: 094 49.0 W

Subject(s) and Details:

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</thead>
<tbody>
<tr>
<td></td>
<td>Party</td>
<td>Not at Risk</td>
<td>Subject of Investigation</td>
</tr>
</tbody>
</table>

Details Filed: None

03/12/2007 0:00:00 to 04/05/2007 0:00:00 (Estimated): [Redacted] requested Galveston Yacht Services dry dock the S/V Cynthia Woods so he could conduct repairs to the vessel's keel.

Action Type: Shore Activities - Fleet Support
Action Class: Schedule Port Maintenance
Location: Known, On Land
Description: PAYCO MARINA 501 BLUME DRIVE, GALVESTON, TX
Report of Investigation

Latitude: 29 17.0 N  Longitude: 094 52.0 W

Subject(s) and Details:

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<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>[Redacted]</td>
<td>Party</td>
<td>Not at Risk</td>
<td>Subject of Investigation</td>
</tr>
</tbody>
</table>

Details Filed: None

03/12/2007 0:00:01 to 03/12/2007 0:00:03 (Estimated): The keel was removed from the hull and cracks found in frames 3, 4, and 5 were repaired on the inside of the vessel by a student worker. The keel was re-installed and fiberglass was used to fair the hull to the keel.

Condition Class: Vessel, Facility, Equipment, Gear, or Cargo
Condition Type: Vessel Material/Equipment Condition
Subject Type: Construction/Loadline
Location: Known; On Land
Description: GALVESTON YACHT SERVICES MARINA
Latitude: 29 19.4 N  Longitude: 094 46.5 W

Subject(s) and Details:

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<td>Total Constructive Loss: Salvaged</td>
<td>Involved in a Marine Casualty</td>
</tr>
</tbody>
</table>

Details Filed: Material/Equipment Condition
System: Construction/Loadline
Sub-System: Hull
Component: Transverse Frame
Details: Vessel required extensive repairs to frames 3, 4, and 5. A student worker attempted to repair the vessel [Redacted] approved the repairs and conducted no third party consultation with a qualified surveyor.

Cite:

10/25/2007 0:00:00 to 10/27/2007 0:00:00 (Estimated): Vessel departed for Harvest Moon Regatta. [Redacted] was operating the vessel as safety officer.

Condition Class: Operations Status
Condition Type: Vessel Operation Status
Subject Type: Known; US Waters
Description: TEXAS A&M SMALL BOAT BASIN
Latitude: 29 18.0 N  Longitude: 094 49.0 W

Subject(s) and Details:

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Status</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYNTHIA WOODS</td>
<td>Vessel</td>
<td>Total Constructive Loss: Salvaged</td>
<td>Involved in a Marine Casualty</td>
</tr>
</tbody>
</table>

Details Filed: None
**Report of Investigation**

10/25/2007 0:00:01 to 10/27/2007 0:00:00 (Estimated): Vessel grounded while participating in the Harvest Moon Regatta.

**Event Type:** Grounding  
**Event Class:** In marked channel  
**Event Subclass:** Full Control  
**Location:** Unknown

**Subject(s) and Details:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Status</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYNTHIA WOODS</td>
<td>Vessel</td>
<td>Total Constructive Loss: Salvaged</td>
<td>Involved in a Marine Casualty</td>
</tr>
</tbody>
</table>

**Details Filed: Grounding Details**

<table>
<thead>
<tr>
<th>Type of Grounding:</th>
<th>Hard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type of Bottom:</td>
<td>Mud</td>
</tr>
<tr>
<td>Depth of Water:</td>
<td>Feet</td>
</tr>
<tr>
<td>Charted:</td>
<td>Feet</td>
</tr>
<tr>
<td>Actual:</td>
<td>Feet</td>
</tr>
<tr>
<td>Recorded:</td>
<td></td>
</tr>
<tr>
<td>Part of Vessel Aground:</td>
<td>Centerline Midships</td>
</tr>
<tr>
<td>Vessel Course:</td>
<td>True</td>
</tr>
<tr>
<td>Vessel Speed:</td>
<td>Knots</td>
</tr>
<tr>
<td>Steering Functional:</td>
<td>Fully</td>
</tr>
<tr>
<td>Propulsion Functional:</td>
<td>Fully</td>
</tr>
<tr>
<td>Hazard to Navigation:</td>
<td>No</td>
</tr>
<tr>
<td>ATON Survey Required:</td>
<td>No</td>
</tr>
<tr>
<td>Fuel On Board:</td>
<td></td>
</tr>
<tr>
<td>Cargo On Board:</td>
<td></td>
</tr>
</tbody>
</table>

**Cargo Name**

**Quantity**

Additional Information: Report of vessel grounding near ICW. Exact depth of water unknown, report made by crewmember onboard

10/25/2007 0:00:02 to 10/27/2007 0:00:03 (Known): Vessel completed race and returned to Texas A&M University Marina.

**Action Type:** Bridge Operations - Shiphandling  
**Action Class:** Maneuver in accordance with sea/river/weather conditions  
**Location:** Known; US Waters  
**Description:** TEXAS A&M SMALL BOAT BASIN  
**Latitude:** 29 18.0 N  
**Longitude:** 094 49.0 W

**Subject(s) and Details:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Status</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Party</td>
<td>At Risk, Not</td>
<td>Subject of Investigation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Injured</td>
<td></td>
</tr>
</tbody>
</table>

**Details Filed: None**

01/24/2008 0:00:00 to 01/24/2008 0:00:00 (Estimated): Dark Water Divers hired by to clean the hull, report on condition of paint, algae growth, barnacle growth, blisters and the need to replace the zins.
Report of Investigation

Condition Class: Vessel, Facility, Equipment, Gear, or Cargo
Condition Type: Vessel Material/Equipment Condition
Subject Type: Operations/Management
Location: Known, US Waters
Description: TEXAS A&M SMALL BOAT BASIN
Latitude: 29 18.0 N     Longitude: 094 49.0 W

Subject(s) and Details:

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
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<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYNTHIA WOODS</td>
<td>Vessel</td>
<td>Total Constructive Loss: Salvaged</td>
<td>Involved in a Marine Casualty</td>
</tr>
</tbody>
</table>

Details Filed: None

01/24/2008 0:00:01 to 01/24/2008 0:00:02 (Estimated): Vessel grounding was reported by Dark Water Diver employee to [Redacted] in the form of a dive report for the vessel.

Event Type: Grounding
Event Class: Unmarked Waterway
Event Subclass: No Control
Location: Known, US Waters
Description: TEXAS A&M SMALL BOAT BASIN
Latitude: 29 18.0 N     Longitude: 094 49.0 W

Subject(s) and Details:

<table>
<thead>
<tr>
<th>Name</th>
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<th>Role</th>
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<td>Vessel</td>
<td>Total Constructive Loss: Salvaged</td>
<td>Involved in a Marine Casualty</td>
</tr>
</tbody>
</table>

Details Filed: Grounding Details

Type of Grounding: Soft
Type of Bottom: Mud
Depth of Water:
  Charted: Feet
  Actual: Feet
  Recorded: Feet
Part of Vessel Aground: Centerline Midships
Vessel Course: True
Vessel Speed: Knots
Steering Functional: Fully
Propulsion Functional: Fully
Hazard to Navigation: No
ATON Survey Required: No
Fuel On Board: [Redacted]
Cargo On Board: [Redacted]

Cargo Name

Additional Information: Vessel grounded due to normal tidal changes in the marina.

01/24/2008 0:00:02 to 06/24/2008 0:00:03 (Estimated): Texas A&M University employees [Redacted] and [Redacted] were notified of the grounding by a report.
Report of Investigation
from the Dark Water Dive Company. No actions were taken to mitigate the hazard of the vessel grounding during the normal semidiurnal tidal cycles.

Action Type: Shore Activities - Set Operating Policy
Action Class: Issue Special Instructions
Location: Known; US Waters
    Description: TEXAS A&M SMALL BOAT BASIN
    Latitude: 29 18.0 N    Longitude: 094 49.0 W

Subject(s) and Details:

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Status</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Party</td>
<td>Not at Risk</td>
<td>Subject of Investigation</td>
</tr>
</tbody>
</table>

Details Filed: None

04/22/2008 0:00:00 to 05/02/2008 0:00:00 (Known): [redacted] requested Galveston Yacht Services dry dock the S/V CYNTHIA WOODS for repairs to the vessel's hull.

Action Type: Shore Activities - Fleet Support
Action Class: Schedule Port Maintenance
Location: Known; On Land
    Description: GALVESTON YACHT SERVICES MARINA
    Latitude: 29 19.4 N    Longitude: 094 46.5 W

Subject(s) and Details:

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Status</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Party</td>
<td>Not at Risk</td>
<td>Subject of Investigation</td>
</tr>
</tbody>
</table>

Details Filed: None

04/22/2008 0:00:01 to 04/22/2008 0:00:03 (Estimated): The hull was cleaned and painted. [redacted] identified but did not repair four hairline cracks between the hull and ribs of the vessel.

Condition Class: Vessel, Facility, Equipment, Gear, or Cargo
Condition Type: Vessel Material/Equipment Condition
Subject Type: Construction/Loadline
Location: Known; On Land
    Description: GALVESTON YACHT SERVICES MARINA
    Latitude: 29 19.4 N    Longitude: 094 46.5 W

Subject(s) and Details:

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Status</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYNTHIA WOODS</td>
<td>Vessel</td>
<td>Total Constructive Loss: Salvaged</td>
<td>Involved in a Marine Casualty</td>
</tr>
</tbody>
</table>

Details Filed: None
Report of Investigation

06/05/2008 0:00:00 to 06/05/2008 0:00:00 (Estimated): Dark Water Divers hired by [redacted] to clean the hull, report on paint condition, algae growth, barnacle growth, blisters, and any zinc replacement requirements. No visible damage of the hull was reported to [redacted].

Condition Class: Vessel, Facility, Equipment, Gear, or Cargo
Condition Type: Vessel Material/Equipment Condition
Subject Type: Construction/Loadline
Location: Known; US Waters
Description: TEXAS A&M SMALL BOAT BASIN
Latitude: 29 18.0 N  Longitude: 094 49.0 W

Subject(s) and Details:

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Status</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYNTHIA WOODS</td>
<td>Vessel</td>
<td>Total Constructive, Loss: Salvaged</td>
<td>Involved in a Marine Casualty</td>
</tr>
</tbody>
</table>

Details Filed: None

06/06/2008 14:00:00 to 06/06/2008 14:00:01 (Estimated): Vessel departed for Veracruz, Mexico with two safety officers and four students.

Condition Class: Operations Status
Condition Type: Vessel Operation Status
Subject Type:  
Location: Known; US Waters
Description: TEXAS A&M SMALL BOAT BASIN
Latitude: 29 18.0 N  Longitude: 094 49.0 W

Subject(s) and Details:

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Status</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYNTHIA WOODS</td>
<td>Vessel</td>
<td>Total Constructive, Loss: Salvaged</td>
<td>Involved in a Marine Casualty</td>
</tr>
</tbody>
</table>

Details Filed: None

06/06/2008 23:38:00 to 06/06/2008 23:40:00 (Estimated): The hull of the S/V Cynthia Woods failed and the keel, keel bolts, and keel plates separated from the hull and sank to the ocean floor.

Event Type: Material Failure (Vessels)
Event Class: Construction/Loadline
Event Subclass:
Location: Known; US Waters
Description: GULF DEEP WATER SPINE
Latitude: 28 29.38 N  Longitude: 094 58.686 W

Subject(s) and Details:

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Status</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYNTHIA WOODS</td>
<td>Vessel</td>
<td>Total Constructive</td>
<td>Involved in a Marine</td>
</tr>
</tbody>
</table>

30
Report of Investigation

Loss: Salvaged  Casualty

Details Filed: Material/Equipment Failure
System: Construction/Loadline
Sub-System: Hull
Component: Keel
Failure: Yes
Category: Catastrophic Failure
Details: The hull failed in an approximately 1" area surrounding the keel plates on the hull. The keel bolts and plate went with the keel to the bottom of the ocean.

06/06/2008 23:38:10 to 06/06/2008 23:40:00 (Known): The keel separated from the hull and sank to the bottom of the ocean.

Condition Class: Vessel, Facility, Equipment, Gear, or Cargo
Condition Type: Vessel Material/Equipment Condition
Subject Type: Stability
Location: Known; US Waters
Description: GULF DEEP WATER SPINE
Latitude: 28 29.38 N  Longitude: 094 58.686 W

Subject(s) and Details:

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Status</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYNTHIA WOODS</td>
<td>Vessel</td>
<td>Total Constructive</td>
<td>Involved in a Marine Loss: Salvaged Casualty</td>
</tr>
</tbody>
</table>

Details Filed: Material/Equipment Condition
System: Construction/Loadline
Sub-System: Hull
Component: Keel Plate
Details: The hull failed in an approximate 1" area surrounding the keel plates on the hull. The keel bolts and plate went with the keel to the bottom of the ocean.

06/06/2008 23:38:30 to 06/06/2008 23:40:00 (Known): Flooding occurred through a hole created from the separation of keel from hull.

Event Type: Flooding
Event Class: Progressive - out of control
Event Subclass:
Location: Known; US Waters
Description: GULF DEEP WATER SPINE
Latitude: 28 29.38 N  Longitude: 094 58.686 W

Subject(s) and Details:
Report of Investigation

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Status</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYNTHIA WOODS</td>
<td>Vessel</td>
<td>Total Constructive Loss: Salvaged</td>
<td>Involved in a Marine Casualty</td>
</tr>
</tbody>
</table>

Details Filed: Flooding Details

- Initial Source: Damage to Hull bilge and cabin
- Area Submerged:
- Route of Water into Vessel: Water entered from the large hole amidships in the center of the hull where the keel would have been attached to the hull.
- Subdivision Standard:
- Watertight Subdivisions Intact: None Fitted
- Watertight Doors Fitted: No
- Were High Level Alarms Fitted: No

06/06/2008 23:39:00 to 06/06/2008 23:40:00 (Estimated): The loss of the keel caused the vessel to lose its stability.

- Event Type: Loss of Stability
- Event Class: Other loss of stability
- Event Subclass: Total Loss of Stability
- Location: Known; US Waters
- Description: GULF DEEP WATER SPINE
- Latitude: 28 29.38 N  Longitude: 094 58.686 W

Subject(s) and Details:

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Status</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYNTHIA WOODS</td>
<td>Vessel</td>
<td>Total Constructive Loss: Salvaged</td>
<td>Involved in a Marine Casualty</td>
</tr>
</tbody>
</table>

Details Filed: None

06/06/2008 23:40:00 to 06/06/2008 23:41:00 (Estimated): The loss of the vessel's keel caused an immediate 90 degree starboard roll of the vessel. The vessel paused and then rolled another 90 degrees capsizing the vessel and leaving it floating on the surface.

- Event Type: Capsize
- Event Class: 
- Event Subclass: 
- Location: Known; US Waters
- Description: GULF DEEP WATER SPINE
- Latitude: 28 29.38 N  Longitude: 094 58.686 W

Subject(s) and Details:

<table>
<thead>
<tr>
<th>Name</th>
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<th>Role</th>
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<tbody>
<tr>
<td>CYNTHIA WOODS</td>
<td>Vessel</td>
<td>Total Constructive Loss: Salvaged</td>
<td>Involved in a Marine Casualty</td>
</tr>
</tbody>
</table>

Details Filed: None
Report of Investigation

06/06/2008 23:45:00 to 06/06/2008 23:46:00 (Estimated): Roger Stone was below deck when the vessel inverted. He failed to egress the cabin and died from drowning.

Event Type: Personnel Casualties
Event Class: 
Event Subclass: 
Location: Known; US Waters
Description: GULF DEEP WATER SPINE
Latitude: 28 29.38 N   Longitude: 094 58.686 W

Subject(s) and Details:

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Status</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>STONE, ROGER</td>
<td>Party</td>
<td>Dead</td>
<td>Subject of Investigation</td>
</tr>
<tr>
<td>WIN-low</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Details Filed: Injury Details

Did death occur: Yes
Was Death Immediate: Yes
Cause of Death: Drowning as per Medical Examiner
Nature of Event Causing Death: Noncontact Injury- Other
Date of Death Known: No
Was Diving Involved: No
Did injury occur: No
Is the Person Missing: No
Subject to Chemical Exposure: No

Exposed to Biological Hazards: No
Exposed to a Confined Space/Respiration Hazard: No
Exposed to Other Hazards: No

Narrative Summary:

06/09/2008 9:00:00 to 06/09/2008 16:00:00 (Known): Galveston County Medical Examiners Office conducted a blood test for alcohol and drugs.

Action Type: Other Actions - Drug and Alcohol Use and Testing
Action Class: Take Drug Test - Post-casualty
Location: Known; US Waters
Description: GULF DEEP WATER SPINE
Latitude: 28 29.38 N   Longitude: 094 58.686 W

Subject(s) and Details:

<table>
<thead>
<tr>
<th>Name</th>
<th>Type</th>
<th>Status</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>[censored]</td>
<td>Party</td>
<td>Dead</td>
<td>Subject of Investigation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Details Filed: Drug and Alcohol Test Details

Sample Collection

Reason for Sample: Other
Directed to get DOT Test: No
Chemical Test Sample Provided: Yes
Chemical Test Type: Alcohol
Sample Type: Blood
Date/Time Sample Taken: 06/09/2008
<table>
<thead>
<tr>
<th><strong>Report of Investigation</strong></th>
<th><strong>Sampling Location:</strong> Chest</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DOT Protocols Used:</strong> No</td>
<td></td>
</tr>
<tr>
<td><strong>Collection Agent Name:</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Collection Agent's Organization:</strong> Galveston County Medical Examiner</td>
<td></td>
</tr>
<tr>
<td><strong>Donor Certified:</strong> Yes</td>
<td></td>
</tr>
<tr>
<td><strong>Irregularities Noted:</strong> No</td>
<td></td>
</tr>
<tr>
<td><strong>Transferred/Chain of Custody Complete:</strong> No</td>
<td></td>
</tr>
<tr>
<td><strong>Chemical Test Type:</strong> Dangerous Drugs</td>
<td></td>
</tr>
<tr>
<td><strong>Sample Type:</strong> Blood</td>
<td></td>
</tr>
<tr>
<td><strong>Date/Time Sample Taken:</strong> 06/09/2008 9:00:00 AM</td>
<td></td>
</tr>
<tr>
<td><strong>Sampling Location:</strong> Galveston County Medical Examiner Office,</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Texas City</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>DOT Protocols Used:</strong> No</td>
</tr>
<tr>
<td><strong>Collection Agent Name:</strong></td>
</tr>
<tr>
<td><strong>Collection Agent's Organization:</strong> Galveston County Medical Examiner</td>
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<td><strong>Donor Certified:</strong> Yes</td>
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<tr>
<td><strong>Irregularities Noted:</strong> No</td>
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<tr>
<td><strong>Transferred/Chain of Custody Complete:</strong> No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Field Sobriety Test</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Field Sobriety Test Performed:</strong> No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Alcohol Analysis</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Method of Analysis:</strong> Blood Test</td>
</tr>
<tr>
<td><strong>Instrument Used:</strong></td>
</tr>
<tr>
<td><strong>Date/Time Results Obtained:</strong> 06/23/2008</td>
</tr>
<tr>
<td><strong>Results:</strong></td>
</tr>
<tr>
<td><strong>Blood Alcohol Content:</strong></td>
</tr>
<tr>
<td><strong>Agency Conducting Analysis:</strong> AEGIS Sciences Corporation</td>
</tr>
<tr>
<td><strong>Description of Analysis:</strong></td>
</tr>
<tr>
<td><strong>Irregularities in Analysis:</strong> No</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Drug Analysis</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Analyzing Laboratory:</strong> Aegis Sciences Corporation</td>
</tr>
<tr>
<td><strong>DOT Protocols Used:</strong> No</td>
</tr>
<tr>
<td><strong>Test Results:</strong></td>
</tr>
<tr>
<td><strong>Coroner:</strong></td>
</tr>
<tr>
<td><strong>Coroner Conclusions:</strong></td>
</tr>
<tr>
<td><strong>Sample Transferred and Chain of Custody Complete:</strong> Yes</td>
</tr>
</tbody>
</table>

| **Drug Re-Analysis** |
V. CAUSAL ANALYSIS

The Initiating Event of the Incident

Material Failure (Vessels) (06/06/2008 11:38:00 PM)

Production Factors

Active Equipment/Material Failures - Active failures of material
Vessel's hull failed after multiple groundings, improper storage of the vessel on its keel in the marina and inadequate repair to known damage on frames 3, 4, and 5.
Material Failure (Vessels): 06/06/2008 11:38:00 PM, GULF DEEP WATER SPINE, CYNTHIA WOODS

Preconditions

LUCs in People - Person Mismatches - Mismatches between the person and the equipment
The keel was removed, reinstalled, cracks in the vessel's ribs were fiberglassed and the vessel was verified as properly repaired by a university employee with no professional training for such repairs or qualification as a marine surveyor.
Vessel, Facility, Equipment, Gear, or Cargo: 03/12/2007 12:00:01 AM, GALVESTON YACHT SERVICES MARINA, CYNTHIA WOODS

Workplace Factors

LUCs in Supervision - Inadequate guidance
Supervisor did not provide guidance concerning reporting procedures for groundings and damage caused to vessels owned by the university.
Vessel, Facility, Equipment, Gear, or Cargo: 03/12/2007 12:00:01 AM, GALVESTON YACHT SERVICES MARINA, CYNTHIA WOODS

LUCs in Supervision - Inadequate operational doctrine
Texas A&M University did not have an operational doctrine which ensured damaged vessels or potentially damaged vessels would be examined or surveyed for damage.
Operations Status: 03/09/2006, TEXAS A&M SMALL BOAT BASIN, CYNTHIA WOODS
The university's risk management system did not establish an operational doctrine that included a policy concerning actions to take with respect to damaged vessels. No procedure is in place to ensure the integrity of a vessel after repairs are completed.
Policy, Procedures, or Regulations: 02/14/2007, TEXAS A&M SMALL BOAT BASIN, CYNTHIA WOODS
Employees of Texas A&M University did not have an operational doctrine that ensures that damaged or potentially damaged vessels be examined by a qualified marine surveyor.
Report of Investigation

Vessel, Facility, Equipment, Gear, or Cargo: 06/05/2008, TEXAS A&M SMALL BOAT BASIN, CYNTHIA WOODS

LUCs in Known Problem Correction - Corrective actions deferred/ignored

The supervisor in charge of the vessel program failed to report and take corrective action on damage to the vessel before it departed for the race on 06JUN08.

Vessel, Facility, Equipment, Gear, or Cargo: 04/22/2008 12:00:01 AM, GALVESTON YACHT SERVICES MARINA, CYNTHIA WOODS

Organization Factors

LUCs in Structure - Improper or insufficient delegation of authority

The university allowed an unqualified employee to determine the safety and integrity of the repairs made by the students.

Vessel, Facility, Equipment, Gear, or Cargo: 03/12/2007 12:00:01 AM, GALVESTON YACHT SERVICES MARINA, CYNTHIA WOODS

LUCs in Oversight - Improper or inadequate risk management

University officials were not aware that the small boat basin's depth was not sufficient for the draft of the S/V CYNTHIA WOODS at low tides.

Vessel, Facility, Equipment, Gear, or Cargo: 11/01/2005 12:00:01 AM, CAPE FEAR YACHT WORKS WILMINGTON, NC, CYNTHIA WOODS

The university did not include a risk management process that considered the ability of the S/V CYNTHIA WOODS to be safely moored at the university's small boat basin. Until asked by USCG Investigators to take soundings, the marina manager did not know the depth of the marina where the S/V CYNTHIA WOODS had been moored for approximately two years.

Operations Status: 03/09/2006, TEXAS A&M SMALL BOAT BASIN, CYNTHIA WOODS

LUCs in Oversight - Improper or absent safety programs

The university had no policy or procedure in place for safety officers or university employees to submit reports of damage or possible damage to vessels operated by the university.

Policy, Procedures, or Regulations: 02/14/2007, TEXAS A&M SMALL BOAT BASIN, CYNTHIA WOODS

Defense Factors

Defenses that were in place but failed due to inadequacy - Inadequate supervision

There were no quality control measures in place to ensure the adequacy of repairs.

Vessel, Facility, Equipment, Gear, or Cargo: 03/12/2007 12:00:01 AM, GALVESTON YACHT SERVICES MARINA, CYNTHIA WOODS

Active Equipment/Material Failures - Active failures of material

Vessel hull separated approximately 1" around the keel boss and keel plates.

Material Failure (Vessels): 06/06/2008 11:38:00 PM, GULF DEEP WATER SPINE, CYNTHIA WOODS

Failures of Defense Against Subsequent Events in the Incident

36
Subsequent Event #1:

Flooding (06/06/2008 11:38:30 PM)

Defense Factors

Active Equipment/Material Failures - Active failures of material
Vessel suffered a keel failure which resulted in a approximately 3' x 1' hole in the bottom; the vessel had no means to control the rate of flooding.
Flooding: 06/06/2008 11:38:30 PM, GULF DEEP WATER SPINE, CYNTHIA WOODS

Subsequent Event #2:

Capsize (06/06/2008 11:40:00 PM)

Defense Factors

Defense Technology Does Not Exist - Defense technology/systems do not exist
Sailing vessels without keels are inherently unstable.
Capsize: 06/06/2008 11:40:00 PM, GULF DEEP WATER SPINE, CYNTHIA WOODS

Subsequent Event #3:

Personnel Casualties (06/06/2008 11:45:00 PM)

Defense Factors

Defense Technology Does Not Exist - Defense technology/systems do not exist
The individual was unable to egress from the cabin of the S/V CYNTHIA WOODS after the vessel capsized.
Material Failure (Vessels): 06/06/2008 11:38:00 PM, GULF DEEP WATER SPINE, CYNTHIA WOODS
VI. REFERRAL FOR ENFORCEMENT ACTION

The following referrals for enforcement action have been made as a result of this investigation and represent those instances where the Coast Guard has gathered evidence that indicates one or more alleged violations or offenses may have occurred. Any determinations as to whether or not one or more actual violations or offenses have occurred are documented in the appropriate Coast Guard enforcement activities.
APPENDIX 1 - EVIDENCE

ECN-3239602-001

Document from the manufacturer of the S/V CYNTHIA WOODS that designed the Cape Fear manufactured vessel.
Collection Information:
   Date/Time: 10/18/2008 9:02:00 PM
   Location: MSU Galveston
   Collected By: USCG Gathered; MSTC MSU Galvstn
   Witnessed By: USCG Witness; MST2 MSU Galvstn

Tracking:
Attachments:
   - ECN-3239602-001.pdf, Marine Safety Unit Galveston; 10/23/2008;

ECN-3239602-002

XXI Regata de Amigos notice of race. Describes the rules, eligibility, classes/ratings, use of transponder, radio communications, entry fee, documentation, skippers meeting, sailing instructions, and contact information.
Collection Information:
   Date/Time: 10/19/2008 10:30:00 AM
   Location: http://www.veracruzregatta.com
   Collected By: USCG Gathered; MSTC MSU Galvstn
   Witnessed By: USCG Witness; MST2 MSU Galvstn

Tracking:
Attachments:
   - ECN-3239602-002.pdf, Marine Safety Unit Galveston; 10/23/2008;

ECN-3239602-003

XXI Regata De Amigos Sailing Instructions. Includes the following: rules, notice to competitors, changes to sailing instructions, schedule of races, classes, warning signals, starting instructions, communications, course, safety rules.
Collection Information:
   Date/Time: 10/19/2008 10:35:00 AM
   Location: http://www.veracruzregatta.com
   Collected By: USCG Gathered; MSTC MSU Galvstn
   Witnessed By: USCG Witness; MST2 MSU Galvstn

Tracking:
Attachments:
   - ECN-3239602-003.pdf, Marine Safety Unit Galveston; 10/23/2008;

ECN-3239602-004

Summary report of position from the required tracking device used by the race committee. This is a download from the 1-Track web page for the S/V CYNTHIA WOODS.
Report of Investigation

Collection Information:
Date/Time: 10/19/2008 10:52:00 AM
Location: http://www.iboattrack.com/
Collected By: USCG Gathered; MSTC [redacted], MSU Galveston
Witnessed By: USCG Witness; BMC [redacted], MSU Galveston

Tracking:
Attachments:
- ECN-3239602-004- [redacted].pdf; Marine Safety Unit Galveston; [redacted]; 10/23/2008;

ECN-3239602-005- [redacted]
PAYCO Inc. work order #2283. Commissioning of S/V CYNTHIA WOODS. Work completed includes, stepping of mast, installation of rudder, and installation of keel.
Collection Information:
Date/Time: 06/16/2008 6:01:00 PM
Location: Galveston, Texas
Collected By: USCG Gathered; MSTC [redacted], MSU Galveston
Witnessed By: USCG Witness; BMC [redacted], MSU Galveston

Tracking:
Attachments:
- ECN-3239602-005- [redacted].pdf; Marine Safety Unit Galveston; [redacted]; 10/23/2008;

ECN-3239602-006- [redacted]
E-mail from [redacted] to [redacted]. E-mail documents that [redacted], [redacted], and [redacted] were aware of the depth of the entrance of PAYCO Marina during normal tides.
Collection Information:
Date/Time: 07/01/2008 2:02:00 PM
Location: Texas A&M University at Galveston
Collected By: USCG Gathered; BMC [redacted], MSU Galveston
Witnessed By: USCG Witness; BMC [redacted], MSU Galveston

Tracking:
Attachments:
- ECN-3239602-006- [redacted].pdf; Marine Safety Unit Galveston; [redacted]; 10/23/2008;

ECN-3239602-007- [redacted]
E-mail from [redacted] to members of the school announcing the arrival on 08 March 2006 of the vessel at the school marina.
Collection Information:
Date/Time: 07/01/2008 2:08:00 PM
Location: Texas A&M University at Galveston
Collected By: USCG Gathered; BMC [redacted], MSU Galveston
Witnessed By: USCG Witness; MSTC [redacted], MSU Galveston

Tracking:
Attachments:
Report of Investigation
- ECN-3239602-007-[-pdf], Marine Safety Unit Galveston, 10/23/2008;

ECN-3239602-008-[-
Transcript of Interview with [-]. Interview conducted by LCDR [-], MSTC [-] and BMC [-].
Collection Information:
  Date/Time: 06/17/2008 3:37:00 PM
  Location: MSU Galveston
  Collected By: USCG Gathered; MSTC [-], MSU Galveston
  Witnessed By: USCG Witness, BMC [-], MSU Galveston

Tracking:
Attachments:
- ECN-3239602-008-[-pdf], Marine Safety Unit Galveston, 10/23/2008;

ECN-3239602-009-[-
Letter from Mr. [-] to Mr. [-] concerning the grounding of the S/V CYNTTHIA WOODS on 08 July 2006.
Collection Information:
  Date/Time: 07/01/2008 1:12:00 PM
  Location: Texas A&M University at Galveston
  Collected By: USCG Gathered; BMC [-], MSU Galveston
  Witnessed By: USCG Witness, MSTC [-], MSU Galveston

Tracking:
Attachments:
- ECN-3239602-009-[-pdf], Marine Safety Unit Galveston, 10/23/2008;

ECN-3239602-010-[-
Damage estimate for recreational assist vessel. Vessel assisted S/V CYNTTHIA WOODS on 08 July 2006.
Collection Information:
  Date/Time: 07/01/2008 1:27:00 PM
  Location: Texas A&M University at Galveston
  Collected By: USCG Gathered; BMC [-], MSU Galveston
  Witnessed By: USCG Witness, MSTC [-], MSU Galveston

Tracking:
Attachments:
- ECN-3239602-010-[-pdf], Marine Safety Unit Galveston, 10/23/2008;

ECN-3239602-011-[-
Haul out and repair receipts from Galveston Yacht Service for the repair of the S/V CYNTTHIA WOODS keel and hull on 12 March 2007.
Collection Information:
  Date/Time: 07/01/2008 3:11:00 PM
  Location: Galveston Yacht Services
Report of Investigation

Collected By: USCG Gathered; MSTC, MSU Galveston
Witnessed By: USCG Witness; MST2, MSU Galveston

Tracking:
Attachments:
- ECN-3239602-011- pdf, Marine Safety Unit Galveston; 10/23/2008;

ECN-3239602-012-

Transcript of interview of 11 June 2008.
Collection Information:
Date/Time: 06/11/2008 10:13:00 AM
Location: MSU Galveston
Collected By: USCG Gathered; LCDR, MSU Galveston
Witnessed By: USCG Witness; MSTC, MSU Galveston

Tracking:
Attachments:
- ECN-3239602-012- pdf, Marine Safety Unit Galveston; 10/23/2008;

ECN-3239602-013-

Receipt for repair of the S/V CYNTHIA WOODS.
Collection Information:
Date/Time: 06/18/2008 10:00:00 AM
Location: Galveston Yacht Center lawyers office
Collected By: USCG Gathered; MSTC, MSU Galveston
Witnessed By: USCG Witness; MST2, MSU Galveston

Tracking:
Attachments:

ECN-3239602-014-

Autopsy Report from Galveston County Medical Examiner of Roger Winalow Stone
Collection Information:
Date/Time: 09/10/2008
Location: MSU Galveston
Collected By: USCG Gathered; MSTC, MSU Galveston
Witnessed By: USCG Witness; BMC, MSU Galveston

Tracking:
Attachments:
- ECN-3239602-014- pdf, Marine Safety Unit Galveston; 10/23/2008;

ECN-3239602-015-

Donation of vessel Gift Letter of Deed, from to Texas A&M University.
Collection Information:
Date/Time: 06/18/2008
Location: Texas A&M University at Galveston
<table>
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<th>Report of Investigation</th>
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<td>Collected By: USCG Gathered; MSTC [redacted], MSU Galveston</td>
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<tr>
<td>Witnessed By: USCG Witness, BMC [redacted], MSU Galveston</td>
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<td>Attachments:</td>
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<tr>
<td>- ECN-3239602-015-[redacted].pdf, Marine Safety Unit Galveston; [redacted]; 10/23/2008;</td>
</tr>
</tbody>
</table>

ECN-3239602-016- [redacted]
S/V CYNTIIIA WOODS manufacturer statement of origin
Collection Information:
- Date/Time: 06/18/2008
- Location: Texas A&M University at Galveston
- Collected By: USCG Gathered; MSTC [redacted], MSU Galveston
- Witnessed By: USCG Witness, BMC [redacted], MSU Galveston
| Tracking: |
| Attachments: |
| - ECN-3239602-016-[redacted].pdf, Marine Safety Unit Galveston; [redacted]; 10/23/2008; |

ECN-3239602-017- [redacted]
20th Annual Harvest Moon Regatta race results
Collection Information:
- Date/Time: 10/23/2008 9:25:00 AM
- Location: www.regattanetwork.com
- Collected By: USCG Gathered; MSTC [redacted], MSU Galveston
- Witnessed By: USCG Witness, BMC [redacted], MSU Galveston
| Tracking: |
| Attachments: |
| - ECN-3239602-017-[redacted].pdf, Marine Safety Unit Galveston; [redacted]; 10/23/2008; |

ECN-3239602-018- [redacted]
Dark Water Divers report for a dive conducted on 14 February 2008.
Collection Information:
- Date/Time: 06/18/2008
- Location: Texas A&M University at Galveston
- Collected By: USCG Gathered; MST2 [redacted], MSU Galveston
- Witnessed By: USCG Witness, MSTC [redacted], MSU Galveston
| Tracking: |
| Attachments: |
| - ECN-3239602-018-[redacted].pdf, Marine Safety Unit Galveston; [redacted]; 10/23/2008; |

ECN-3239602-019- [redacted]
Collection Information:
- Date/Time: 07/17/2008 9:30:00 AM
- Location: MSU Galveston

43
Report of Investigation

Collected By: USCG Gathered; MSTC [REDACTED] MSU Galveston
Witnessed By: USCG Witness; BMC [REDACTED], MSU Galveston

Tracking:
Attachments:
- ECN-3239602-019-[REDACTED].pdf, Marine Safety Unit Galveston; [REDACTED]; 10/23/2008;

ECN-3239602-020-

Collection Information:
Date/Time: 06/18/2008
Location: Texas A&M University at Galveston
Collected By: USCG Gathered; MSTC [REDACTED], MSU Galveston
Witnessed By: USCG Witness; MSTC [REDACTED], MSU Galveston

Tracking:
Attachments:
- ECN-3239602-020-[REDACTED].pdf, Marine Safety Unit Galveston; [REDACTED]; 10/23/2008;

ECN-3239602-021-

Offshore Sail Team Meeting on 02 September 2007.
Collection Information:
Date/Time: 06/18/2008 9:33:00 AM
Location: Texas A&M University at Galveston
Collected By: USCG Gathered; MSTC [REDACTED], MSU Galveston
Witnessed By: USCG Witness; BMC [REDACTED], MSU Galveston

Tracking:
Attachments:
- ECN-3239602-021-[REDACTED].pdf, Marine Safety Unit Galveston; [REDACTED]; 10/23/2008;

ECN-3239602-022-

S/V CYNTIA WOODS Checklist, Pre-departure, Underway, Return and Docking.
Collection Information:
Date/Time: 06/18/2008 9:35:00 AM
Location: Texas A&M University at Galveston
Collected By: USCG Gathered; MSTC [REDACTED], MSU Galveston
Witnessed By: USCG Witness; BMC [REDACTED], MSU Galveston

Tracking:
Attachments:
- ECN-3239602-022-[REDACTED].pdf, Marine Safety Unit Galveston; [REDACTED]; 10/23/2008;

ECN-3239602-023-

Instructions for S/V CYNTIA WOODS crew for the Regata De Amigos.
Collection Information:
Date/Time: 06/18/2008
Location: Texas A&M University at Galveston
Report of Investigation

Collected By: USCG Gathered; MSTC, MSU Galveston
Witnessed By: USCG Witness, BMC, MSU Galveston

Tracking:
Attachments:
- ECN-3239602-023-[redacted].pdf, Marine Safety Unit Galveston; [redacted]; 10/23/2008;

ECN-3239602-024-[redacted]
Inventory taken by [redacted] after recovery of S/V CYNTHIA WOODS.

Collection Information:
Date/Time: 06/16/2008 9:39:00 AM
Location: Texas A&M University at Galveston
Collected By: USCG Gathered; MSTC, MSU Galveston
Witnessed By: USCG Gathered; MSTC, MSU Galveston

Tracking:
Attachments:
- ECN-3239602-024-[redacted].pdf, Marine Safety Unit Galveston; [redacted]; 10/23/2008;

ECN-3239602-025-[redacted]
T&T Marine Salvage Daily Job Log for recovery of vessel 08, 10 and 11 June 2008.

Collection Information:
Date/Time: 06/17/2008
Location: T&T Marine Salvage
Collected By: USCG Gathered; MSTC, MSU Galveston
Witnessed By: USCG Gathered; MSTC, MSU Galveston

Tracking:
Attachments:
- ECN-3239602-025-[redacted].pdf, Marine Safety Unit Galveston; [redacted]; 10/23/2008;

ECN-3239602-026-[redacted]
T&T Marine Daily Job Log for recovery of S/V CYNTHIA WOODS' keel.

Collection Information:
Date/Time: 06/17/2008 9:44:00 AM
Location: T&T Marine Salvage
Collected By: USCG Gathered; MSTC, MSU Galveston
Witnessed By: USCG Gathered; MSTC, MSU Galveston

Tracking:
Attachments:
- ECN-3239602-026-[redacted].pdf, Marine Safety Unit Galveston; [redacted]; 10/23/2008;

ECN-3239602-027-[redacted]
Notes from interview with [redacted] on 13 June 2008, taken by CDR James E. Elliott, USCG.

Collection Information:
Date/Time: 06/13/2008
ECN-3239602-028

Photo of crew onboard S/V CYNTHIA WOODS taken 06 June 2008, the photo shows no liferaft on deck.

Collection Information:
- Date/Time: 06/18/2008
- Location: Texas A&M University at Galveston Webpage
- Collected By: USCG Gathered; MSTC [redacted], MSU Galvstn
- Witnessed By: USCG Witness; BMC [redacted], MSU Galvstn

ECN-3239602-029

Six photos taken while vessel was at Galveston Yacht Service.

Collection Information:
- Date/Time: 07/23/2008 7:21:00 AM
- Location: Texas A&M University at Galveston
- Collected By: USCG Gathered; MSTC [redacted], MSU Galvstn
- Witnessed By: USCG Witness; MST2 [redacted], MSU Galvstn

ECN-3239602-030

Photo of vessel's electronic equipment recovered from vessel, cleaned and activated. Lat and Long indicates location where vessel's electronic equipment failed.

Collection Information:
- Date/Time: 06/30/2008 7:25:00 AM
- Location: MSU Galveston
ECN-3239602-031

Photo of top of vessel keel indicating all bolts and keel mounting plates still attached and evidence of hull failure around keel.

Collection Information:
Date/Time: 07/02/2008 7:27:00 AM
Location: T&T Marine Salvage
Collected By: USCG Gathered; MSTC [REDACTED], MSU Galvstn
Witnessed By: USCG Witness; BMC [REDACTED], MSU Galvstn

Tracking:
Attachments:
- ECN-3239602-031- [REDACTED].pdf, Marine Safety Unit Galveston; [REDACTED];
  10/31/2008;

ECN-3239602-032

Photo of bilge of S/V CYNTHIA WOODS showing evidence of repair of floor and frames.

Collection Information:
Date/Time: 07/02/2008 7:30:00 AM
Location: T&T Marine Salvage
Collected By: USCG Gathered; MSTC [REDACTED], MSU Galvstn
Witnessed By: USCG Witness; BMC [REDACTED], MSU Galvstn

Tracking:
Attachments:
- ECN-3239602-032- [REDACTED].pdf, Marine Safety Unit Galveston; [REDACTED];
  10/31/2008;

ECN-3239602-033

Photo showing evidence of repairs of frame numbers three, four and five, the crack in frame three is circled in this photo.

Collection Information:
Date/Time: 07/02/2008 7:33:00 AM
Location: T&T Marine Salvage
Collected By: USCG Gathered; MSTC [REDACTED], MSU Galvstn
Witnessed By: USCG Witness; BMC [REDACTED], MSU Galvstn

Tracking:
Attachments:
- ECN-3239602-033- [REDACTED].pdf, Marine Safety Unit Galveston; [REDACTED];
  10/31/2008;

ECN-3239602-034

Photo showing evidence of repair and damage to frame number four.
Report of Investigation

Collection Information:

Date/Time: 07/02/2008 7:35:00 AM
Location: T&T Marine Salvage
Collected By: USCG Gathered; MSTC [REDACTED], MSU Galveston
Witnessed By: USCG Witness; BMC [REDACTED], MSU Galveston

Tracking:
Attachments:
- ECN-3239602-034-[REDACTED].pdf, Marine Safety Unit Galveston; [REDACTED]; 10/31/2008;

ECN-3239602-035-

Photo showing evidence of damage to frame number three and location of hole number eight drilled for evidence.

Collection Information:

Date/Time: 07/02/2008 7:37:00 AM
Location: T&T Marine Salvage
Collected By: USCG Gathered; MSTC [REDACTED], MSU Galveston
Witnessed By: USCG Witness; BMC [REDACTED], MSU Galveston

Tracking:
Attachments:
- ECN-3239602-035-[REDACTED].pdf, Marine Safety Unit Galveston; [REDACTED]; 10/31/2008;

ECN-3239602-036-

Photo of keel of S/V GEORGE PHYDIAS immediately after removal from Texas A&M Small Boat Basin. Photo shows evidence the vessel's keel was aground and submerged in the mud bottom by approximately one foot.

Collection Information:

Date/Time: 07/23/2008 7:39:00 AM
Location: Texas A&M University at Galveston
Collected By: USCG Gathered; MST2 [REDACTED], MSU Galveston
Witnessed By: USCG Witness; MSTC [REDACTED], MSU Galveston

Tracking:
Attachments:
- ECN-3239602-036-[REDACTED].pdf, Marine Safety Unit Galveston; [REDACTED]; 10/31/2008;

ECN-3239602-037-

Photo showing evidence of damage and repair to frame number five, the circle in this photo indicates where frame number five was drilled for a sample for analysis.

Collection Information:

Date/Time: 07/02/2008 7:42:00 AM
Location: T&T Marine Salvage
Collected By: USCG Gathered; MSTC [REDACTED], MSU Galveston
Witnessed By: USCG Witness; BMC [REDACTED], MSU Galveston

Tracking:
Attachments:
- Frame Number Five.pdf, Marine Safety Unit Galveston; [REDACTED]; 11/25/2008;
ECN-3239602-038

CYNTHIA WOODS TIGER TEAM REPORT

Collection Information:
  Date/Time:  12/11/2008 11:55:00 AM
  Location:  MSU GALVESTON
  Collected By:  USCG Gathered; LCDR [REDACTED], MSU Galvstn
  Witnessed By:  USCG Witness,

Tracking:

Attachments:
  - UNITED STATES COAST GUARD TIGER TEAM INVESTIGATION OF THE SV CYNTHIA WOODS INVESTIGATION; Marine Safety Unit Galveston; [REDACTED], 12/11/2008, Permanent
APPENDIX 2 - CORRESPONDENCE

84862 - Letter to Structural Composites with two enclosures.
Source: USCG
Type: Outgoing
Sent: To Melbourne, Florida on 07/07/2008 4:37:00 PM
Attachments:
  - Structural Composites Inc 07UL08.pdf; Marine Safety Unit Galveston; [redacted], 10/18/2008;

85016 - Subpoena issued to Galveston Yacht Center refused by [redacted]
Source: USCG
Type: Outgoing
Sent: To Galveston Yacht Center on 06/13/2008
Attachments:
  - Subpoena Galveston Yacht Center.pdf; Marine Safety Unit Galveston; [redacted], 10/23/2008;

85017 - Subpoena issued to T&T Marine Salvage, Signed by [redacted]
Source: USCG
Type: Outgoing
Sent: To T&T Marine Salvage Office on 07/17/2008
Attachments:
  - Subpoena T&T Marine 2.pdf; Marine Safety Unit Galveston; [redacted], 10/23/2008;

85018 - Subpoena issued to T&T Marine Salvage, Signed and accepted by [redacted].
Source: USCG
Type: Outgoing
Sent: To T&T Marine on 06/24/2008 12:53:00 AM
Attachments:
  - Subpoena T&T Marine.pdf; Marine Safety Unit Galveston; [redacted], 10/23/2008;

85019 - Subpoena issued to Dark Water Divers. Accepted and signed by [redacted].
Source: USCG
Type: Outgoing
Sent: To Dark Water Divers on 07/17/2008 5:55:00 AM
Attachments:
  - Subpoena Dark Water Divers.pdf; Marine Safety Unit Galveston; [redacted], 10/23/2008;

85020 - Testing Protocols questions from [redacted] to LT [redacted], USCG.
Source: 3rd Party
Type: Incoming
Received: At MSU Galveston E-mail system on 06/30/2008 9:42:00 AM
Attachments:
85021 - E-mail to structural composites clarifying an issue with the numbering of the samples.
Source: USCG
Type: Outgoing
Sent: To MSU Galveston e-mail on 07/22/2008 3:09:00 PM
Attachments:
- Structural Composites Inc 22JUL08.pdf; Marine Safety Unit Galveston; 10/23/2008;

85022 - Protocol for the collection of samples and inspection of keel bolting and fiberglass reinforced plastic (FRP) substrate of the vessel Cynthia Woods. Dated 29JUN08.
Source: 3rd Party
Type: Incoming
Received: At MSU Galveston on 06/29/2008
Attachments:
- 85022.pdf; Marine Safety Unit Galveston; 10/23/2008;

85023 - Protocol for the drilling and taking core samples on the hull and reinforcements of the S/V Cynthia Woods.
Source: 3rd Party
Type: Incoming
Received: At MSU Galveston Office on 07/01/2008 6:08:00 AM
Attachments:
- 85023.pdf; Marine Safety Unit Galveston; 10/23/2008;

85024 - Inspection and test protocols for Texas A&M Sailboat Accident
Source: USCG
Type: Incoming
Received: At MSU Galveston Office on 06/01/2008 6:10:00 AM
Attachments:
- 85024.pdf; Marine Safety Unit Galveston; 10/23/2008;

85025 - Request for Salvage Engineering Response Team Support
Source: USCG
Type: Outgoing
Sent: To SERT Office on 06/13/2008 6:17:00 AM
Attachments:
- Request for SERT Support.pdf; Marine Safety Unit Galveston; 10/23/2008;

85026 - USCG Investigative Service Evidence Custody Form for S/V Cynthia Woods Physical Evidence
Source: USCG
Type: Outgoing
Sent: To Texas A&M General Counsel on 07/02/2008 7:00:00 PM
Attachments:
- Evidence Custody Form for A&M Property 1.pdf; Marine Safety Unit Galveston; 10/23/2008;
Report of Investigation

- Evidence Custody Form for A&M Property 2pdf.pdf; Marine Safety Unit Galveston; 10/23/2008;

85027 - Cynthia Woods Recovery Operation Plan from T&T Marine
Source: 3rd Party
Type: Incoming
Received: At MSU Galveston e-mail on 06/10/2008 1:14:00 AM
Attachments:
- Salvage plan from T&T.pdf; Marine Safety Unit Galveston; 10/23/2008;

85028 - Letter sent with the raw thermal images taken by the Cape Fear Yacht Works, LLC’s thermographer on 01 JUL 08
Source: 3rd Party
Type: Incoming
Received: At MSU Galveston mail on 07/28/2008
Attachments:
- Thermal Disk Letter.pdf; Marine Safety Unit Galveston; 10/23/2008;

85029 - Coast Guard Investigative Service evidence custody form.
Source: USCG
Type: Outgoing
Sent: To Digital Legal (transcription service) on 06/25/2008 6:46:00 AM
Attachments:

87319 - CYNTHIA WOOD augmented ROI
Source: USCG
Type: Incoming
Received: At MSU GALVESTON on 12/11/2008 10:15:00 AM
Attachments:

87329 - Augmented ROI
Source: USCG
Type: Incoming
Received: At MSU GALVESTON on 12/11/2008 11:43:00 AM
Attachments:
- CYNTHIAWOODSINVESTIGATION.doc; Marine Safety Unit Galveston; 12/11/2008; Permanent
Appendix 1 – Evidence
CAPE FEAR 38
REGATTA VERSION

APPROXIMATE HULL DIMENSIONS
LOA (HULL) 37.75'
LWL 34'
Beam 11'
Draft: Std 6' 7.2'
Displacement 10,000 Lbs
Ballast 4650 Lbs

Auxiliary 29 hp Volvo
Fuel 25 gal
Water 50 gal

J 50.0'
E 13.75'
W 48.0'
H 17.2'

Hullhead Asymmetrical
Wl 54.5'
SPL. (Retractable Sprit) 11'

Main Sail Area 550 sq ft
104% Jib 380 sq ft
Upwind SA 880 sq ft
Hullhead Asym. 1440 sq ft

DESIGNED BY: BRUCE WARREK, P.E.
MARKS YACHT & DESIGN
WILMINGTON, NC
www.capefearyachtworks.com

CAPE FEAR
YACHT WORKS
111 BRYAN RD.
WILMINGTON, NC 28412
810-385-0169

Appx Dep/Length Ratio = 114
Appx SA/Depi Ratio Upwind = 30
Appx SA/Depi Ratio Downwind = 87

7.2' draft
8.0' Available

"CAPE FEAR 38 REGATTA"
WWW.CAPEFEARYACHTWORKS.COM

Illustrative only: Drawings & Specifications subject to change


**XXI Regata de Amigos**

**NOTICE OF RACE**

June 6th-14th, 2008

40th Anniversary Regatta

**EVENT DESCRIPTION:**

This Regata de Amigos celebrates 40 years and is organized and conducted by Lakewood Yacht Club (LYC) and Galveston Bay Cruising Association (GBCA) and the joint Race Committee as formed by the organizing Clubs. This race from Galveston, Texas to Veracruz, Mexico has become one of the major international yacht races in the Western Gulf of Mexico. The Regatta attracts attention and interest throughout the Gulf Coast. In addition to providing keen competition over a 630-mile course, it affords sailors and their families an opportunity to enjoy Mexico's finest hospitality and to visit the rare and wonderful Mayan antiquities located in the State of Veracruz. Many of the boats will stop overnight at Tuxpan and make a day stop at the Lobos Island reefs for snorkeling, scuba and beach parties before returning home. Once in port, Mexican Naval personnel will be assigned to guard the yachts. The Mexican Customs and Immigration process for racers will be expedited by personnel located nearby.

**SECTION 1 – RULES:**

The regatta will be governed by The Racing Rules of Sailing (RRS) 2005-2008 including US SAILING Prescriptions, the 2008 Category I International Sailing Federation Special Regulations, aka Offshore Racing Congress (ORC) Special Regulations, PHRF of Galveston Bay and by this Notice of Race and the Sailing Instructions. LYC and GBCA reserve the right to amend this Notice of Race and Rules by the Sailing Instructions. The ORC Category I requirement for uncoated lifelines under section 3.14.6a is waived. Lifelines shall, in all respects, conform to Section 2.03.1 of the General Requirements.

**SECTION 2 – ELIGIBILITY:**

The regatta is open to any sailing yacht which is of a thoroughly seagoing type, strongly built and rigged, fully seawaysorthy, and meeting the standards set forth herein. Cruising yachts meeting equipment standards are encouraged to participate. Entry of yachts below 27 foot in length will be subject to approval of the Race Committee.

**SECTION 3 – CLASSES/RATINGS:**

The following classes are anticipated:

- PHRF Spinnaker
- PHRF Non-Spinnaker
- Cruising Spinnaker
- Cruising Non-Spinnaker
- Sail/Motor
- Motor yacht
- SOS-TEX
- Port Aransas Cruising Non-Spinnaker
- Port Isabel Cruising Non-Spinnaker
Other Classes at the discretion of the Race Committee

Handicaps will be calculated on a course of 630 nautical miles. A signed copy of the yacht's year 2008 PHRF certificate will be mandatory for all PHRF classes. Galveston Bay PHRF Ratings will supersede all rating certificates from other PHRF regions. Cruising class boats that do not have PHRF certificates will be individually rated by PHRF of Galveston Bay acting as an adjunct to the Race Committee. Multi-hull handicaps will be established by the Race Committee.

SECTION 4 - GPS TRANSPONDER

All boats entering the regatta shall carry a GPS transponder provided by Horizon Marine. Full information on the transponder and associated regatta tracking website may be obtained at: veracruzzrhost.com and ibotstrack.com.

SECTION 5 - RADIO COMMUNICATION

Boats shall be permitted to make radio transmissions while racing and receive radio communications including but not limited to VHF, SSB, cell phones and satellite phones. This changes RRS 41.

SECTION 6 - ENTRY FEE:

The entry fee for this regatta will be $375.00 which includes the use of the Horizon Marine GPS transponder. Skippers will be required to complete a credit card security deposit form in the amount of $495.00 to Horizon Marine. The credit card will not be charged unless the transponder is not returned to the Race Committee by 6.28.08. A late fee of $50.00 will apply after May 12th. The deadline for all entries is May 23, 2008. The Entry Form is available at: http://www.veracruzzrhost.com/entryform2008.doc

SECTION 7 - DOCUMENTATION:

Each person is required to have a Mexican Tourist Card and a valid Passport. Entries will be subject to a charge for a Tourist Card as required by Mexican Immigration. Additionally a Port Fee will be charged by the Veracruz Port Authority. You must have proof of vessel ownership and several copies of Lista de Tripulantes signed by the captain (forms provided in Skippers package). It is the responsibility of each skipper to secure complete documentation for the yacht and crew. U.S. Customs requires a form and a fee and proof of documentation or registration.

SECTION 8 - SKIPPER'S MEETING:

The Skippers Meeting will be held at 1900 hours at the LYC ballroom on May 30th, 2008.

SECTION 9 - SAILING INSTRUCTIONS:

Preliminary Sailing Instructions will be available on the regatta website: veracruzzrhost.com. The final Sailing Instructions will be available at the Skipper's Meeting

SECTION 10 - FURTHER INFORMATION

Further information and the full schedule of events may be obtained at the regatta website as it becomes available or by contacting the Organizing Authority:

LYC Event Chairman: protec.equipment@gmail.com

GBCA Principal Race Officer: uescontrols.com
XXI Regata de Amigos

SAILING INSTRUCTIONS
June 6th to 14th, 2008

1. THE RULES
The Regatta will be governed by the rules as defined in the current Racing Rules of Sailing (RRS), the Notice of Race and these Sailing Instructions. Boats shall comply with the ISAF Special Regulations for Category 1, including the US SAILING prescriptions. This rule is adopted for the safety of vessel and crew. Non-compliance with this rule may not be used as a basis of protest by competitors. This modifies RRS 60.

2. NOTICES TO COMPETITORS
Notices to competitors will be posted on the official notice board located near the trophy case in the club house lobby at Lakewood Yacht Club and on the Race Committee Room door at the Fiesta Inn Malecon Hotel in Veracruz.

3. CHANGES TO SAILING INSTRUCTIONS
Any written change to the sailing instructions will be posted before 2000 the day before it takes effect. Oral changes to the sailing instructions may be given on the water. Any oral change will be communicated to each boat via VHF radio at Check In.

4. SCHEDULE OF RACES, CLASSES, WARNING SIGNALS
PORT ARANSAS/PORT ISABEL: Boats may elect to start in the "Port Aransas" or the "Port Isabel" fleet on Friday, June 6, 2008 at 1400 hours at red channel marker R"6", FL R 4s, Bell and the R "8", FL R 6s, respectively. Both the Port Aransas and Port Isabel starts will be on the honor system. The time of all honor starts shall be recorded by the individual boats starting.

GALVESTON FLEET:
All other boats shall start on Friday, June 6, 2008 in the following order.

<table>
<thead>
<tr>
<th>WARNING SIGNAL</th>
<th>FLAG COLOR</th>
<th>CLASSES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not earlier than 1400 hours</td>
<td>PINK</td>
<td>PHRF Spinnaker</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Cruising Spinnaker</td>
</tr>
<tr>
<td>Approx. 5 minutes after</td>
<td>LIGHT BLUE</td>
<td>PHRF Non-Spinnaker</td>
</tr>
<tr>
<td>prior start</td>
<td></td>
<td>Cruising Non-Spinnaker</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A/B</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Sail/Motor</td>
</tr>
<tr>
<td>Approx. 5 minutes after</td>
<td>GRAY</td>
<td>Multihull</td>
</tr>
<tr>
<td>prior start</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. CHECK IN FOR GALVESTON START
Boats starting in Galveston shall check in with the Race Committee on VHF Channel 68 prior to their warning signal. Failure to check in will not be grounds for protest by competitors.

6. THE START
a. Starting signals will be made in accordance with RRS 26. The Race Committee may, as a

http://www.veracruzregatta.com/sil.htm

10/19/2008
courtesy, announce the starting sequence on VHF Channel 72. RRS 26 is summarized as follows:

<table>
<thead>
<tr>
<th>Signal</th>
<th>Flag and sound</th>
<th>Minutes before Start</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warning</td>
<td>Class Flag; 1 sound</td>
<td>5</td>
</tr>
<tr>
<td>Preparatory</td>
<td>P Flag; 1 sound</td>
<td>4</td>
</tr>
<tr>
<td>One-Minute</td>
<td>P Flag removed; 1 long sound</td>
<td>1</td>
</tr>
<tr>
<td>Starting</td>
<td>Class Flag removed; 1 sound</td>
<td>0</td>
</tr>
</tbody>
</table>

b. Boats whose warning signal has not been made shall keep clear of boats whose warning signal has been made.

c. As a courtesy, the Race Committee will attempt to hail, on VHF Channel 72, any boat that is over early at the start; however, any such hail, its timeliness or absence, shall not be grounds for redress. This modifies RRS 62.1(a).

d. In the event of a general recall of a class, the warning signal for the restart of that class will be 5 minutes after the last published start and the start of any previously recalled class. This modifies RRS 29.2.

e. Sailboats are reminded that RRS 42 requires that boats compete using only the wind and water to increase, maintain, or decrease her speed. Engines cannot be used for propulsion while a boat is racing. A boat is racing at her preparatory signal, which occurs 4 minutes before her start.

f. Boats within a motoring class must sail for at least thirty minutes after the start before engaging the engine for propulsion. Additional rules are attached as an addendum for motoring classes.

g. The Race Committee boat will remain on station for thirty minutes after the last start; a boat starting more than thirty minutes after the last start shall attempt to notify the Race Committee via VHF Channel 72 of its intent to race. Failing contact with the Race Committee the boat should contact the LYC office at 281 474-2511 and report its intent to race. This modifies RRS A4.

7. STARTING LINE
   a. The Starting Line will be between a staff displaying an orange flag on the Flagship Pier on the starboard end, and an orange tetrahedron on the port end.
   b. If weather conditions dictate, the start may be moved inside the Galveston jetties. The Race Committee will notify participants via radio on VHF Channel 72 starting approximately one hour prior to the first published start time, should the Starting Line be relocated. In that event, the Starting Line will be a line between Galveston Channel Green #11 and an orange Race Committee Shore Flag located on a platform on the southerly shoreline at approximately 1,100 yards distance and bearing approximately 200 degrees from Galveston Channel Green #11. Boats shall leave channel marker 5A to starboard.

BOATS ARE CAUTIONED TO STAY WELL OFF OF THE SHORELINE TO AVOID SHOAL WATER. BOATS SHALL AVOID COMMERCIAL SHIP CHANNEL TRAFFIC AND FOLLOW THE COLREGS. SPECIAL ATTENTION IS CALLED TO RULE 9.

8. COMMUNICATIONS
   During the race, boats shall be permitted to communicate at will by any means at their disposal including but not limited to VHF, SSB, cell phones and satellite phones. This changes RRS 41.

   a. The Regatta working channel will be VHF channel 72. This channel will be used by the Race Committee at the start and for the finish, and for communications between boats while offshore.
   b. The check-in and docking Committee will use VHF channel 68 for mooring assistance.
   c. Communications in route should be tailored to your situation. If you want to communicate at any time, please do so; if you wish to remain silent, that's your choice. Communications other than starting and finishing are for your convenience and utility. It is difficult to maintain a contact schedule due to the rapid separation of the boats within the fleet and the varying ranges of radios. You will probably find it more efficient to see a schedule with the boats that you

http://www.veracruzregatta.com/s11.htm

10/19/2008
are able to communicate with as opposed to the boats within your sailing class. It is recommended
that boats standby and monitor VHF channel 16 and hail other boats within the regatta on that
channel. Upon contact, boats should switch to the regatta working channel 72.

9. RACING AREA
The race area will be the waters of the Gulf of Mexico and the Bay of Campeche.

10. THE COURSE
Yachts are to proceed from the starting line to the finishing line in Veracruz, Mexico.

11. SAFETY RULES
All racing boats should comply with the published Coast Guard standards for safety equipment
and nighttime lighting requirements. All racing boats must obey the Rules of the Road and any
applicable Coast Guard standoff zones when encountering other vessels. This is especially true when
encountering commercial traffic. Failure to do so will be grounds for disqualification from the Race.

12. THE FINISH
The Finish Line at Veracruz is a line between two jetty lights, one at the south outer entrance to
Veracruz harbor (Fl G 5s 10m 10M) and the other at the end of the inner jetty, Muro de Pescadores
(Iso 2s 15m 11M). A diagram of the Finish Line is included as an Addendum to these Sailing
Instructions.
NOTE: The Race Committee sights the line from a calibrated mark at the RC room that may not
seem square to a boat on the water. Continue sailing until you are declared finished by the Race
Committee.

13. FINISHING PROCEDURES
When approximately through the reefs, notify the Race Committee on VHF Channel 72 so they can
prepare to take your finish time.
As you approach the Finish Line, call the Race Committee and give a countdown as you cross the
Finish Line (i.e. "5,4,3,2,1, mark) and record your time.
Clear the Finish Line as soon as possible and proceed to the Malecon mooring area (see Finish Line
diagram. The Malecon runs generally southwest from light Iso G 2s 5m 6M).
Upon securing your boat, Skippers and crew shall check in with Mexican Customs in the Fiesta Inn
Malecon Hotel. Filling out the Declaration of Completion is required and should be turned in to the
Race Committee at your earliest convenience.

14. VESSEL FLAGS
Each vessel should properly fly the Mexican National Flag and the U. S. Ensign (Not the yacht ensign) while
in Mexican waters. The Mexican flag should be flown from the starboard spreader and the U. S. Ensign from
the stern staff. The Mexican flag should also be flown while at anchor in the Veracruz harbor. Mexican
Customs will not require flying the "Q" or quarantine flag prior to clearance into Veracruz.

15. TIME LIMIT
The Regatta will be concluded as of 1200 hours, Central Daylight Savings Time (Texas time),
Saturday, June 14th 2008. Boats finishing after this time will be scored as Time Limit Exceeded.
This modifies RRS 35.

16. PROTESTS AND REQUESTS FOR REDRESS - RULES ENFORCEMENT
   a. Sail boat racing is a self-policing sport. Competitors are expected to act in the highest
      Corinthian tradition when a rule is violated and do penalty turns or withdraw from the race as
      appropriate to the breach.
   b. Intent to protest and the identity of the protested boat shall be relayed to the Race Committee as

http://www.veracruzregatta.com/si1.htm 10/19/2008
soon as possible after finishing for incidents occurring while the protesting boat was racing. 
c. Protests must be filed in writing within two hours after the finish of the protesting boat or within 
two hours of the relevant incident, whichever is later. 
d. Written protests will be filed with the Race Committee at the Fiesta Inn Malecon Hotel in 
Veracruz. 
e. At the sole discretion of the Protest Committee, a breach of a rule may be subject to an alternate 
penalty of at least one hour added to the corrected time of the infringing boat. This modifies 
RRS 64.1(a).

17. SCORING 
a. Scoring for PHRF rated boats will be based on the rating as assigned by the PHRF Committee of 
Galveston Bay (PHRFGB) as shown on that boat's current 2008 Certificate. 
b. Scoring for Cruising Spinnaker and Non-Spinnaker and the Sail Motoring Class shall be based 
on ratings as assigned by the Race Committee. 
c. For purposes of calculating corrected finishing times, the official course length for boats starting 
at Galveston is 630 nautical miles and official course length for boats starting at Port Aransas is 
520 nautical miles and the official course length for boats starting at Port Isabel is 420 nautical 
miles. 
d. Corrected times for all classes will be based on time-on-distance calculation.

18. WITHDRAWING PROCEDURES 
The Race Committee places high priority on accounting for every boat that starts this regatta. Boats 
that cannot be accounted for after a reasonable amount of time could be subject to search and rescue 
efforts. For this reason and the international character of this event, it is imperative that any boat 
withdrawing from the race make its best and most persistent efforts to notify other parties of such 
withdrawal at the earliest opportunity. Withdrawing boats should first make an effort to contact 
other nearby boats to communicate the withdrawal. Any boat receiving information of a 
withdrawal should immediately report such information to the Race Committee upon arrival 
in Veracruz. It is mandatory that any withdrawing boat phone the Lakewood Yacht Club 
office at the first opportunity to report the withdrawal. The phone number at LYC is 281 474- 
2511 and this phone is answered 24 hours a day, seven days a week. After hours at LYC security 
guards will answer or if they are on rounds a message may be left on their phone mail system.

Finally, any withdrawing boat should also report such withdrawal to the Skipper's emergency 
contact as indicated on the Emergency Contact List. Proper reporting of a withdrawal should 
include; boat name, boat sail number and skipper's name. E-mails may be sent to the Race 
Committee in Veracruz at kevinb@sescontrols.com 
Boats withdrawing from the Regatta and not reporting such withdrawal may be barred from future 
participation in events sponsored either by the Galveston Bay Cruising Association or Lakewood 
Yacht Club. 
If a yacht has reason to believe that the onboard Horizon Marine transponder is overboard or 
otherwise inoperable (e.g. severe damage, etc.) then that yacht shall make every effort to report said 
failure using the same procedures as described above for withdrawal.

20. ADDENDA 
The following addenda are included: 

1. Finish Line Diagram 
2. Motor Class Rules and Engine Log 
3. Declaration of Completion 

http://www.veracruzregatta.com/si1.htm 10/19/2008
4. Schedule of Veracruz Events
5. Estimated Time of Arrival Form/Banquet Attendance
6. Regatta Classes and Ratings

ADDENDUM NO. 1
FINISH LINE DIAGRAM
ADDENDUM NO. 2
MOTOR CLASS RULES AND ENGINE LOG

Yachts sailing in the motoring class are required to proceed under sail for at least thirty (30) minutes after their start. Thereafter yachts are required to keep a log of start and stop times of motoring. This log should be turned in to the Race Committee along with the Declaration of Completion. Scoring for this class will be based on computing a corrected time using the boats assigned rating and time-on-

http://www.veracruzregatta.com/si1.htm
distance calculations. For purposes of further correcting a boat's time, a penalty of 1.75 hours per hour of motoring time will be added to the corrected time. Any boat other than PHRF classes may drop into the motoring class by simply starting their engine for purposes of propulsion and declaring as such.

**Engine Log**

<table>
<thead>
<tr>
<th>Start Time</th>
<th>Shutdown Time</th>
<th>Elapsed Motor Time</th>
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<tbody>
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</tbody>
</table>

**Total Elapsed Motor Time**

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**ADDENDUM NO. 3**

**DECLARATION OF COMPLETION**

**XXI REGATA DE AMIGOS - 2008**

This Declaration should be completed by your navigator after crossing the Finish Line. This form must be turned in to the Race Committee at your earliest convenience.

As Skipper/Captain of ____________ (boat name), an entrant in the XXI Regata de Amigos,

http://www.veracruzregatta.com/si1.htm

10/19/2008
I certify to the following facts:

- The correct finish time for our vessel was _______ hours, _______ seconds (e.g. 1531 hours, 30 seconds, or 3:31:30 pm), Central Daylight Savings Time (Texas time) on the _____ day of _____, 2008.

- To the best of my ability, I identify the boat finishing ahead as ____________, and the boat finishing behind as ______________.

CERTIFIED TO:

Signature of Skipper/Captain

ADDENDUM NO. 4
SCHEDULE OF VERACRUZ REGATTA EVENTS

Friday, June 6th  Galveston - Race Start  2:00pm
Thursday, June 12th  Friendship Party at Veracruz Yacht Club  8:00pm
Friday, June 13th  Veracruz Mayor's Reception
     Ceremony for Skippers and one other person only.
     Skippers must wear long pants and shirt with collar.

http://www.veracruzregatta.com/si1.htm

10/19/2008
ADDENDUM NO. 5
ESTIMATED TIME OF ARRIVAL/BANQUET ATTENDANCE

To eligible for the ETA trophy, you must turn in this form at the Skippers Meeting or phone in your ETA to the LYC office prior to the race start.

ESTIMATED TIME OF ARRIVAL
CENTRAL DAYLIGHT SAVINGS TIME - TEXAS TIME

BOAT NAME: ______________ SKIPPER: ______________

ESTIMATED FINISH TIME:
DATE: ______________
HOUR: ______________
MINUTE: ______________
SECOND: ______________

http://www.veracruzregatta.com/si1.htm

10/19/2008
ADDENDUM NO. 6
REGATTA CLASSES AND RATINGS

**Division: PHRF-A**

<table>
<thead>
<tr>
<th>Sail</th>
<th>Boat</th>
<th>Skipper</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>GBR 5598 T</td>
<td>Kenal</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>44766</td>
<td>Rosalita</td>
<td></td>
<td>42</td>
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<tr>
<td>238</td>
<td>Surprise</td>
<td></td>
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</tr>
<tr>
<td>41243</td>
<td>Diablesse</td>
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</table>

**Division: PHRF-B**

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<tbody>
<tr>
<td>52107</td>
<td>Centurion</td>
<td></td>
<td>78</td>
</tr>
<tr>
<td>109</td>
<td>Material Girl</td>
<td></td>
<td>87</td>
</tr>
</tbody>
</table>

http://www.veracruzregatta.com/si1.htm

10/19/2008
### Division: Cruising Spinnaker

<table>
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<th>Sail</th>
<th>Boat</th>
<th>Skipper</th>
<th>Rating</th>
</tr>
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<tbody>
<tr>
<td>10104</td>
<td>La Isla</td>
<td></td>
<td>114</td>
</tr>
<tr>
<td>40</td>
<td>Ole'</td>
<td></td>
<td>132</td>
</tr>
<tr>
<td>37261</td>
<td>Ruthless</td>
<td></td>
<td>138</td>
</tr>
<tr>
<td></td>
<td>Dreamboat</td>
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<td>138</td>
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### Division: Multihull

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<tbody>
<tr>
<td>F 351</td>
<td>Blue Moon</td>
<td></td>
<td>-87.000</td>
</tr>
</tbody>
</table>

### Division: Cruising Non-Spin A

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<thead>
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<th>Sail</th>
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<th>Rating</th>
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<tbody>
<tr>
<td>52438</td>
<td>Cynthia Woods</td>
<td></td>
<td>61</td>
</tr>
<tr>
<td>1650</td>
<td>Star Fish</td>
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<tr>
<td>46</td>
<td>Sea-quail</td>
<td></td>
<td>121</td>
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<tr>
<td>1152</td>
<td>Sute Deern</td>
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<td>129</td>
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<tr>
<td>48</td>
<td>Revelry</td>
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</tr>
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</table>

### Division: Cruising Non-Spin B

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<th>Boat</th>
<th>Skipper</th>
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</tr>
</thead>
<tbody>
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<td>Ciclón</td>
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<tr>
<td>135</td>
<td>Asylum</td>
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</tr>
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<td>14</td>
<td>Kokomo</td>
<td></td>
<td>162</td>
</tr>
<tr>
<td>52751</td>
<td>Rasta Mama</td>
<td></td>
<td>162</td>
</tr>
<tr>
<td>A 204</td>
<td>Panacea</td>
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### Division: Cruising NS Port Aransas

<table>
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<tr>
<th>Sail</th>
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<tr>
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### Division: Cruising NS Port Isabel

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<td>T 37</td>
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### Division: Sail/Motor (1 boats) (top)

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<tr>
<td>23</td>
<td>Pipe Muh Bligh</td>
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</table>
Regata de Amigos XXI
Summary Report for Cynthia Woods

Follow this link to download complete data.

Start time  Fri Jun 06 2008 14:00:00 CDT
Finish time  Withdrawn

Elapsed time

Corrected elapsed time

<table>
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<th>Time (CDT)</th>
<th>Position</th>
<th>Boat speed &amp; heading TO</th>
<th>Wind speed &amp; dir FROM</th>
<th>Wave ht &amp; dir TO</th>
<th>Atmos. pressure</th>
<th>Dist. to finish</th>
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<tr>
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</table>
PAYCO INC.
501 Blume Dr.
at Galveston and causeway
Galveston, Texas 77554
PHONE (409) 744-7428

Enclosure: 003 page 1 of 5
Case #: 106-72
ECN 324902-005

Work Order

2283

Date: 11.18

Head Out

Owner:

Boat Name: Cynthia
Tax Exempt/Reg. No:
LOA:
Boat Type: Cape Fear 38

City: ____________________________ State: ____________________________ Zip: ____________________________ Telephone: ____________________________

Order Taken by: ____________________________

(409) 641-437

I hereby represent and authorize the above work to be done, along with the necessary materials to be furnished, and agree to pay for such work and materials at your usual and customary charges, subject to payment of the charges and any applicable taxes. If the work is not completed to my satisfaction, I reserve the right to reject the work and to require the work to be redone at the expense of the person or company responsible. The work is guaranteed for 12 months from the date of completion. I understand that all payments must be made at the time of service, and that failure to do so may result in a 10% late charge. I also authorize the use of credit cards for payment of the above charges.

Haul Out: $342.00
Parts: $211.25
Total Labor: $800.00
Water-Washer: $0.00
Paint, Etc.: $0.00
Lay Days: $0.00

Tickets: $1916.37
Mishap: $0.00
Outside Work: $0.00
Sub Total: $2714.58
Tax: $271.46
Total: $2985.04

1. Haul out
2. Parts
3. Lay Days
4. Tickets
5. Mishap
6. Outside Work
7. Sub Total
8. Tax
9. Total

I hereby authorize the above work to be done, along with the necessary materials to be furnished, and agree to pay for such work and materials at your usual and customary charges, subject to payment of the charges and any applicable taxes. If the work is not completed to my satisfaction, I reserve the right to reject the work and to require the work to be redone at the expense of the person or company responsible. The work is guaranteed for 12 months from the date of completion. I understand that all payments must be made at the time of service, and that failure to do so may result in a 10% late charge. I also authorize the use of credit cards for payment of the above charges.

Received: 11.18

INVESTIGATING OFFICER
U.S. COAST GUARD
1915512305

11.18

COMPARING COPY WITH IT, AND FIND THIS TO BE A TRUE COPY.

Billed 4/2/06
PAYCO, INC
01 BLUME DR.
ALVESTON, TEXAS 77554
PHONE (409) 744-7425

Date: 11-16-05

OLD TO: Cynthia Woods
ORDER NO: 60-44147

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<td>1</td>
<td>46</td>
<td>labor grat keel + Hull truck up</td>
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<td>2</td>
<td>65</td>
<td>cathead inten + 2x 50 davits</td>
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<td>2</td>
<td>64</td>
<td>labor R&amp;R gunnel stop bracket + steering linkage</td>
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SALES TAX: exempt

Enclosure: date page 7 of 3
Case #: 400787
ECN 325902-005

I HAVE SEEN THE ORIGINAL AND COMPARED THIS COPY WITH IT, AND FIND THIS TO BE A TRUE COPY.

INVESTIGATING OFFICER
U.S. COAST GUARD
MARINE SAFETY UNIT
GALVESTON, TEXAS
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<td>483 cherry picker set &amp; max</td>
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<td>685</td>
<td>484 priate propeller set &amp; install</td>
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<td>Welding by Butt &amp; Argon to Fabricate Heavy</td>
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<td></td>
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<td>Aluminium steering stops</td>
<td>140.00</td>
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<td></td>
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<td>ROLL AT HULL with Travel Lift</td>
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<td>5.23</td>
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<td>epoxy roller paint &amp; primer</td>
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Enclosure: 005 page 3 of 5
Case # 486727
ECN 3239602 - 005
**Description (do not use brand name):**

Commissioning of Cape Ten 38' Sportfisher "Cynthia"

**Unit Price:** $2,000

**Total:** $2,000

**Date:** 1/18/95

**Account:** 301015

**ECN:** 7239-02-005

**Case #:** 106727

**Enclosure:** 005 page 4 of 5

**Purchase Order Number:** 301015

**INVESTIGATING OFFICER:**

**U.S. COAST GUARD**

**MARINE SAFETY UNIT**

**SALVESTON, TEXAS**

**EQUIPMENT:**

- [ ] Trolling Motor
- [ ] Depth Finder
- [ ] Anchor Chain
- [ ] Anchor
- [ ] Electric Outboard Motor

**Note:**

HAVE SEEN THE ORIGINAL, COMPARED THIS COPY WITH IT, AND FIND THIS TO BE A TRUE COPY.

**Signature:**

**APPROVED:**

**DATE:** 1/18/95

**WITNESS:**

**DATE:** 1/18/95

**ASSISTANT:**

**DATE:** 1/18/95
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</table>

To begin receiving direct deposit payments, simply complete the Vendor Direct Deposit Form at http://www.tamug.edu/fiscal/Accounts Payable/vendordirectdeposit.pdf or call (409) 740-4430.

TAMUG employees should use the form at http://mmst.tamug.tamu.edu/fiscal/Direct_depInst.pdf

Student refunds processing through the Student Management Information System (SIMS) are not eligible for direct deposit.

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Enclosure: DOC  page 5 of 6
Case #: 406 727
ECN 3239602 - 005

I HAVE SEEN THE ORIGINAL AN, COMPEARED THIS COPY WITH IT, AND FIND THIS TO BE A TRUE COPY.

INVESTIGATING OFFICER
U.S. COAST GUARD
MARINE SAFETY UNIT
GALVESTON, TEXAS
Good afternoon,

We will look forward to the meeting which will probably be scheduled for the Vice President's Conference Room in our Classroom/Lab Building. [Redacted] will finalize and provide you directions and parking info. Along with [Redacted] and myself, I am going to include [Redacted] of our Physical Plant and Marine Terminal, and [Redacted] of Communications, who has been our family contact if they are available that day. Let me know who will be coming from TAMU.

By the way, Mr. [Redacted] has given the George Phylidas to TAMU and the Cynthia Woods to TAMUG. The George Phylidas is still currently located at the PAYCO private marina as is the Cynthia Woods. We are hoping the tides will permit us to move it to campus next week. The mouth to that marina has only around 5' of water except during really high tides, and the boats have around 8' draft.

The Cynthia Woods must still be outfitted before she can come to campus.

Regards,

---Original Message---
From: [mailto:][redacted]@rec.tamu.edu
Sent: Wednesday, January 04, 2006 9:59 AM
To: [redacted]
Subject: RE: [redacted] Boat: Cynthia Woods

Mr. [Redacted]

Thanks so much for your response to my e-mail. I have scheduled the visit/meeting for Thursday, January 26. Can you schedule a room for the meeting between 10:30 am-Noon. Also can you send me directions on how to get to your office and where to park once on campus? Here is the preliminary agenda for the day.

7:30 a.m. - Leave College Station
10:30 a.m. - Arrive at Galveston
10:30-Noon - Meet with [Redacted] & [Redacted] TAMUG Sailing Team Advisor
Noon-1:30 p.m. - Lunch
1:30 pm - Meet at the TAMUG Marine Terminal to see the boat
3:30 p.m. - Leave Galveston
6:30 p.m. - Arrive in College Station

Let me know if you any questions or concerns.

Howdy

We got the Cynthia Woods moved to our basin Wednesday, and I know that has been in touch with you about moving forward with the christening. I wanted to let you know that both boats ended up with a logo we use (an ATM with a wave under it) and the word Galveston on them. This was done at Payco Marina when they were outfitting the boats. The best I can ascertain, and asked for an electronic copy of our logo in one of their early visits checking out Payco; and they probably did not realize that the logo was one specific to the Galveston campus. At any rate, I suspect you will want to get that changed; and I would appreciate your letting your student sailors know that it was not done with any malicious intent by TAMUG.

Have you folks come to any conclusion on where you want to permanently berth the George Phyleus? If you decide on the Mitchell Campus, I want to move forward with our work on the MCU.

Have a good Spring Break.

Regards,
My name is Marine Science Technician Chief [Redacted]. It is June 17, 2008, approximately 15:37 p.m. We are at the conference office of the Marine Safety Unit Galveston. With me in this desk are the following people:

Senior Chief, [Redacted], Marine Safety Unit Galveston Investigations.
Lieutenant Commander [Redacted], Chief of Prevention Marine Safety Unit Galveston.

[Redacted], Research Assistant Texas A&M University of Galveston.

[Redacted], can you detail your position at the University?

[Redacted], I do a variety of work within the school first I'm a research assistant with the researching graduate office. I am also partially employed with Coastal Geology Lab and on occasions I take out some of the larger research vessels on a research work.

[Redacted], What is your relationship to the marine terminal and its operation there at the university?

[Redacted], Doing my undergraduate and my graduate work, I work for them part-time. I have my captain’s license and I would go and take research trips with Roman Empire and the Romulan to research vessels that they have.

[Redacted], What time period would that have been served?

[Redacted], Approximately from 2000 to 2006.

[Redacted], Okay, do you have or have you had involvement with sailing vessels or any of those there.

[Redacted], Yes. On occasions I have to pull the sailing vessels off ground throughout those years.

[Redacted], To the best of your recollections, can you walk us through those incidents all that you can recall.

[Redacted], Around 2003 we had one of the sailing vessels I believe it was The Revelly ran a ground outside the Houston Yacht Club. I pulled them off that grounding probably in 2005. The Revelly also was run to ground on Redfish Island, pulled them off ground there. Approximately two years ago, an attempt to get the Cynthia Woods sailing vessel out of Payco Marina. They tried to leave the Marina there. They shortly ran a ground on two occurrences, first was we failed to get it out and second I was able to get it through that narrow channel out into the main channel.

[Redacted], Okay. How when you say you tried to get it off ground how did you do that and with which vessel?
Using the Roman Empire, which is a 40-foot twin-engine, diesel-powered vessel, originally, I believe it is for Louisiana Fisheries Department. I believe that was the boat originally came from its used on occasion to do research trips.

Okay, so the best you recollections this is first time you were not able to get it free.

That's correct, when we took it out of, the way the Marina is situated out there, I don't know if you guys have been to Payco or not, probably have, they have where they lift the boats out and there is a little kind of finger pier that goes along parallel to where they maintain the vessels. It was tide up to that little finger pier. They were attempting to move out. I was there just to assist in case needed. It ran a ground shortly after leaving that pier. We pulled it may be a 100 yards or so and decided that the tide wasn’t sufficient to continue the effort so then I pulled it back to that finger pier and it was decided at that time to wait until a higher tide period and reattempt that. Probably within two or three weeks we had a high tide, I brought the Roman Empire back from the campus to pick a marine. We tied lines, stern the bowel on to the Cynthia Woods and pulled it through that narrow channel where it is pretty much constantly in contact with the substrate.

Could you say that again constantly contact.

With the bottom, the mud and bottom.

So that Cynthia Woods when you pulled it was....

Dragging basically.

Dragging the whole time. How far, what’s the distant that it.

Probably over a mile or so from the Marina to the inner coastal, may be two miles.

Was that being dragged by the bowel?

I had to clean it off from the stern to the research vessel to the bowel of the Cynthia Woods that’s correct.

Okay.

About halfway into that pull it became harder ground in the mud and they brought another vessel over to, lean the mast over to get that keel out of the mud and then we continued on.

Which way did you pull the mast was it port.
To Starbert.

You pulled it to Starbert?

Yes sir. Once we cleared that narrow channel into inner coastal they were free and they sailed it the rest of the way well motored it the rest of the way to the campus.

Who was on board the vessel during that?

Originally it was on the Roman Empire. I had with me. We had some other was initially on there. We took off to lighten up the load and we tried to get it as bare as we could to get through that channel very narrow it's muddy on the bottom.

So who was on the vessel?

 and I believe one of the student sailors was on the boat, I cannot tell you which one.

Both times?

Yes, both times.

You seemed to have lot of problems getting out of there. If there is any problem getting into that Marine?

They brought the boat in on a trailer.

This is upon delivery.

This is the initial delivery?

Yes that is correct. I believe, we discussed I believe there is a seven foot draft on that boat and it is very seldom that you have that water coming out of that Marina.

Any other instances with this vessel that you can recall?

In about two months after that probably, year and 10 months I guess roughly there was some dignitaries that came in, some from the campus and some from College Station and they took a tour out on the Cynthia Woods and I don't have the dates because I really I didn't login as a time or anything like that. I just did as a favor to campus. I got a call from saying that they were party ground on big reef area. You guys familiar what that is right? Okay, South jetties, there is a finger that has
built up sand over the years that comes off on big reef park, which is the right base of the Jetty and it is work itself close to the channel.

When the tide is low you got to be careful, not get trapped into that little “v”, they got trapped in that “v” and tried to cross that bar and failed to do so. I got a call from Jim Atchley saying that they ran out of ground and was there anyway that I could help them to get them off the ground. Since I was by myself I took one of our smaller vessels and we have a 25-foot Parker twin and aboard, got in the boat, grabs some lines went out there and pulled up relatively close my bowl to their star bert and took one of the students off of the boat, [redacted] who is one of the students that was rescued, I believe, but [redacted] was on my vessel working the lines. Initially, they were coming back in to the channel. So the bowl was toward the campus or toward the bay. We had decided to continue pulling it that way, it was already up in the middle of the sand bar when it ran a ground. Tide was going out at that time, so we were losing water fast. Another boat came in and helped with the pull and we were able to get it off ground.

Can you tell me how the tow was configured?

I had to clear it off from the port side of the Parker and the second boat what appeared to me had it just the opposite, so I was pulling on the right side, he was pulling on the left side. He had cleared it off his Star Bert; I had to clear it off my port.

Were you pulling forward?

Yes, we were pulling forward. It took us about an hour to get the boat off ground, took quite a while. We do a lot of surveying out there so I’m real familiar with that sand bar and they had gotten almost off of the bar when they did run a ground so that’s why we decided to pull it forward even though it was against the tide, I felt like it would be been more dangerous trying to pull it back over that sand bar again.

Any other instances?

I have to bring several boats back, but not from grounding, mechanical problems.

The last time we were talking about harder ground in the big reef area with, you said there was approximately one year and two months ago.

Two months after it was put in the water so it will be one year and 10 months I guess and those were approximate dates again I didn’t write things down, it was just someone give me a call and I responded.

Any subsequent conversations or any subsequent knowledge you had from these tows, had any damage to them?

No.
You previously said in 2003 the Revelly ran to the ground.

Yes.

In 2005 again. Are you aware of any difference in construction of the Revelly as compared to Cynthia Woods.

My seeing that Revelly out of the water, you know I am not a sailor, but it does not have the keel configuration that what the Cynthia Woods is. The Cynthia Woods is a racer and the other boats are more of a pleasure sailing vessels.

But basically was there any consideration of that when went into tow the vessels any consideration that this is a different type of vessel than say the Revelly.

You know, I have still never seen either one of those, the Cynthia Woods or the George Phydias out of the water. Now subsequence after the disaster we just had, I did look and see that the configuration of both that's on the bottom before then I have no prior knowledge of that been any difference than the keels that I have seen on the other boats.

Okay, is there anything that you would like to tell us about this vessel, I mean is there any conversations that you've had since the incident.

Since the incident that Monday I visited with [redacted] just to I guess back up a little bit that Friday, the day they left. I agreed to take over some their trips while [redacted] was gone and so I stopped by Friday, it been a years I have done those sea camp trips, I was saying was it the same do you want me to do the same that it used to be or something has changed whatever I don't want to get out there to get upset with me, so we were discussing that and in fact as we were discussing it, [redacted] came by, wanting to know where he can park his vehicle and so that interrupted us for moment, but I knew that [redacted] and [redacted] were close friends so that Monday I agreed to take the trips and even though we had the disaster, I drove down there and I went down and talked to [redacted] for a moment and we didn’t discuss anything about groundings or damage to the hull, I was just seeing how he was doing. You know, if there was anything I could do just name it and I ended up taking those trips that Monday and then Tuesday they stopped all use of the vessels, so I did take the trips on Monday, but that was the basis of our conversation, see how he was handling everything.

If you are operating one of the vessels that you operate and there is damage or some thing happens to the vessels or kind of internal reporting form, you have to fill out and give to the university?

Other than the daily log to put down so I grounded here or there and that is the only place that it shows up.

Is that log kept on the vessel typically?
No, it was kept in the office. The Roman has its own log book and the Malin has its own log book and those are the two vessels that I primarily used.

So those log books are kept in the office at the Marina?

That’s correct.

Is that case of all the vessels there? That you are aware of at least that you’ve operated?

No just for these two. When a tow or something like that, something smaller boat, I don’t track that with logs. I haven’t been told to track that with logs with the larger vessels, every trip is logged in and anything out of the ordinary is put in the log. It will tell where we are going and when we come back, fuel use, the weather, things like that.

Have you heard any conversation about the vessel about cracks or anything in the hull or around the keel.

Yes. The thing that I wanted to be sure everything this part of the stuff is hearsay? I didn’t see anything. I am not a big sailboat person, but you know I heard that there was some groundings coming into the Marina and that there had been some damage, other than that you know I heard someone telling me that they did some fiberglass repair, but I don’t know that for a fact. Sometimes don’t get along that well with each other and so there is some fussing that goes on back and forth between those two and sometimes I’m kind of stuck as the middle person because I am not vested in anything that is there, so both of them can come and talk to me, grip about the other all this because you know I guess that’s my personality, so there has been some complaints about the money spent on sailboats versus the power vessels, that kind of stuff goes on, whether it is accurate or not I don’t now. All I know was that I heard that there was a grounding may have been a couple, one of them I heard was coming into the Marina, the way the configuration of the Marina is I don’t know if you guys been there either into campus, but there is a small inlet that comes into the Marina and during low tides you got to be really careful. There is a piece of concrete in center of the channel and so that low tide you can’t center the boat in there, you got to come in off one side or the other and in super-low tides I have put the clutches in neutral and just glided through, so I didn’t tear up a wheel in the process of getting in there and (19:34) so he comes through. So with the 7-foot draw in that vessel and low tide that would be a very difficult thing to get into the Marina, unless you knew exactly where that boulder or that concrete is.

During this, you know conversation, we took a note, did you give a timeframe that one might take place.
You know it may be in January. I mean they go out sailing every weekend if the weathers cooperative and so.

I mean, you know you understand we are just trying to get the information.

I understand that you know this killed everybody at A&M, because were such a tight community and to lose somebody its just unthinkable almost especially this way, but yes all I know it could have been you know early in the year January, December or something like that. Again, someone was griping about someone else. It's just sometimes it does not stay inside very long, it goes in one ear and out the other because it does not matter to me, because I've heard it for years.

With respect to the concrete block and the inlet that leads into I guess the piers there at the edge of campus is that common knowledge from people who sailed there.

Yeas.

Does that have anything to do with the fact that only. With respect to sailing vessel, to my understanding that only certain people allowed to take them in, take them out or bring them in.

I don't know.

Okay.

All I know is that you drive by and see one of them come in they have seven or so sail boats and sometimes several of them are out so I assumed that those student sailors are operating those on their own.

Okay, so that piece of concrete, it has been hit probably a few times.

Sure. I've bumped it.

Has there ever been a discussion of removing it.

What I was told and I got my license in I believe in March 2001 and so I started regularly running the boats then, it was my understanding back then that they had tried to remove that piece of concrete and it was conflict that the size of it made it where they couldn't scoop it and pull it out.

It was back in 2001?

I was told that then so I do not know how long that piece of concrete was there. I was told that and that was the standard line that you received when you fussed about it.
Does it appear on any type of chart or anything?

No.

As a professional Mariner would you consider that as a hazard of navigation in and out of that channel that small area.

For someone that wasn't familiar with that Marina, yes, but it was my understanding that it was pretty particular about who operated the vessels and it'd be my understanding that he would inform them of that especially on the sailboat that would hit you in the hhm. I mean you could get away with some of the power boats like I said putting it in neutral and just gliding through because it kind of sets up like that as you slow down.

Approximately what kind of depth are we talking about?

Like about an average tide I mean.

You know it is going to be about six foot because I waited out there one time doing something else I was diving for something and I thought I'm going to see what that stupid thing is and so I could barely stand on it.

Was it approximately 6 foot? It's a cement block?

It's a, I didn't dive down, I mean it's to muddy to see it, but I felt around and it is more of a pad they came from somewhere concrete pad.

So it is perfectly square you can walk on top of.

It has a flat side to it, yes.

Flat, the top is flat?

At an angle, it feels like a giant sidewalk slab.

Something man made.

Sure.

Was there any, did you guys do any type of risk assessment before you put a boat in the water or before you even get under way.

You mean as far as I don't know what it does with the sail boats. Again whenever I am talked to him on taking the trip, I am aware of those hazards there.
You are aware of the weather you take that into mind when you get under way.

Yes, I was going to go fishing that weekend this last weekend or the weekend before last when the accident occurred and I cancelled out because of weather.

Is the weather posted like in Marina somewhere. Is there a place where that's kind of posted? Is there a computer available to print up the more reports.

Not well in Jim's office I am sure he'd have that available.

Have you been in Jim's office?

Yeah.

Is there anything to tell, what the status of the vessels are. If there's problems in the vessels is it written up somewhere.

At one time they used to have it on a chalk board, but they don't use it anymore, I don't think. Again, I haven't been. This was the first time I had used the Romulan in a year.

You said that you did research with the university so you familiar with some of the capabilities what type of research would you have been doing.

Actually, we go out and do sand sources and one of the sand sources is big reef and so we have been out there with pontoon boats getting cores, doing photometry with that 25-foot Parker we do grids, I've gridded that whole area.

Has there been any grid done for the area with the concrete block.

No.

No discussion of that. Not really a topic of interest from a scientific stand point.

No. There is no sand there. We look for sands for the beach.

Like how sand builds up into certain areas.

Right now, the general land office is looking for sand to do a major beach replenishment project and they are probably going to use that sand that we've found at Big Reef so. It'll be gone soon probably. They've harvest from that area before and it is a rebuilt, the last 10 to 12 years.

Anything else come to mind?
The, you mentioned before the log book for your vessel, the Roman?

The Roman Empire has a separate log and Romulan has a separate log.

The Roman I believe you onboard the day you went over to pull it off, the first day they put into water again, I guess.

That's correct.

Would that be in the log book you think that date, would that be.....

No.

That would not be in the log book.

You can look and see, but chances since this wasn't a formal trip I probably didn't filled out a log. I may have usually I'm pretty good. It could still be there.

Okay, thank you.

I really tried to, but there has been times, when I've been told not to fill it out.

You have been told not to fill it out.

Yes sir,

Can you please elaborate?

It's just, you know if it is a real minor thing that I was like going to get fuel or something like that, I have told not to fill out the log book.

Do you have any knowledge of anyone else towing off a sailboat with either the Roman Empire or the Romulan.

No I don't think so.

After the incident, did anyone, I am sure you were talking to some of the people around the Marina.

Its a zillion things being thrown at me. But yes go ahead.

Did anyone say I knew this was going to happen or come.
Sure. You know there has been I had speculation today that all this 
crappy vessel...

If you were to make a list of people that we might want to talk to that may be 
we have not talked to is there anyone particular you might suggest that we talked to that 
might just give us some good background information on other issues. May be someone 
not directly affiliated with the university or someone on different staff that we might.

I think you needed to talk to about everybody at Payco if you haven't 
already that's my opinion. Sometimes, those guys will just do what you ask to do I mean 
their minimum wage guys and sometimes you know how that works. I think you know if 
there is something to be had, it is going to be had there.

Is that a long-term Texas University relationship with Payco, is that an 
ongoing thing.

Yes. It’s been there that relationships been there since I have been with 
the University and that Payco includes not only Payco there at the Galveston yacht basin 
too, so even though it's two different places Payco still operates both of them.

And is there anybody else we should talk to or that might help us with this planning out the.

You know, there really hasn't been any other captains or anything or 
deck hands that have been involved in this kind of, they don't, they have a position and 
its been open for ever since I've been at the school. They have a temporary captain's 
position and they offered $10 an hour for that position for a captain. I know and it's a 
joke and no one even takes that seriously and so anytime that can't take a trip, he's 
on vacation or there's periods where both boats need to be in the water, I have always just 
volunteered and done it just to help out, so there really hasn't been anybody else. I guess 
one other person that you probably need to visit, I am sure you have .

Who is that?

One of crew members on the Cynthia Woods.

He has done a lot of, he's I am pretty sure that he is kind of a part time 
student worker there for the Marina. For our Marina.

Well at least he was when you last worked for them.

Yes, he's done a lot. He's deck hand for a lot of the trips and stuff like 
that.
Are you sure about the persons that were present with the two groundings that you talked about.

I don’t, it was 7 or 8 people on the vessel, when I was grounded at Big Reef and you know as far as everybody that was aboard the boat I don’t know.

Well. I am pretty good with that one because we had info about that already, because I think that even [Illegible] was on that one that day, it is pretty well documented, one that I really interested who is onboard?

Yes, I just remember [Illegible] being the one that was on the boat, I don’t, I can’t imagine I am being on there by myself, I don’t remember whether he was or he wasn’t.

Okay, but you mentioned Mr. [Illegible]

Yes, he was one. I believe he was on the first attempt and may be not the second. He was on one of them. It was just funny that you know we made [Illegible] get off the boat because he was too heavy.

Was there any discussion previously drop according to above that pick up or the depth of water?

I was not a part of it.

But do you now of any discussion there was.

No, I don’t. You know it’s one of these things [Illegible] I needed your help, can you bring the Roman over to Payco and I’d say sure you know give me a day and I will work around it.

Where the vessel was sitting was that where is was exactly where it was dropped into the water or did it move around in Marina? Was that right underneath the crane where it was sitting.

No, there was that little cut, that notch. There at Payco they drop it in the notch and then they use the lines to pull it around to that finger pier. The boat was in the water when I got there with the wound and then it stayed there on the finger pier until the next high tide that we attempted, we did the second attempt.

So, help me out kind of visualize, I know you can’t see under the water, In my understanding would it still been resting on the keel or the keel still in the mud sort of speak.

You know, you can when the water is clear over at Payco you can look down there it is not very deep, so my guess that it could have been touching the bottom. Did I see that, no.
But, you couldn't get it out from there because of water depth for couple of weeks.

That's correct and I don't, the couple of weeks is an estimate.

Okay.

I don't remember the time lapse. I just remember every few days I would call and would say, well the tide is close, but is not good enough. We'll try it again, so I get the false alarms and let's go let's don't, let's go let's don't.

Did they lighten the vessel in any way to try to float her up. Did they remove fuel or water or anything like that.

I don't know. I assume that it was fairly empty especially after first attempt I can imagine trying to do that with anything on there that wasn't necessary.

You know, have any knowledge of anybody taking it back to Payco marina, attempted to take it back to Payco after that.

I think after that first time that they didn't go back because everybody felt like it couldn't so that is why the started taking to the GYB, because of that in fact the GYB was is pretty shallow at times too I use to have a boat over there so you have to be kind of cautious where they lift the boat out. Places like that usually get filled up it's so.

We appreciate for coming in. Thank you very much.
July 17, 2006

To: Mr. [Redacted]

From: [Redacted], Ph.D.

RE: Cynthia Woods Grounding

Findings:

Small Boat Basin, was returning from a day sail in the Gulf of Mexico Saturday afternoon July 7, 2006 with [Redacted] on board the Cynthia Woods. A student crew of three students was also on board. Following an afternoon of sailing under light winds, the Cynthia Woods began her trip back to the Small Boat Basin. She entered the Galveston jetties leaving Marker 5A to starboard and proceeded to Marker 7. Approximately 100 yards south of Marker 7, the Cynthia Woods turned west to a heading of 270 degrees on an inbound course for Galveston Harbor. According to [Redacted], this is the same course and approach to Galveston Harbor he has taken for the past 35 years. At 1500 the boat ran hard aground approximately 1/2 mile south of Marker #9 in an area where shoaling is known to occur. Current charts do indicate this as a shallow area as the bottom is sand and the sand bars tend to move from time to time depending on tide strength and wave action. Even though aware of the shoal, [Redacted] reiterated he was unaware that shoaling had built up that far into the channel. Initial thought was that the keel was merely caught on a sandbar so he proceeded forward in an attempt to cross the shoal. In hindsight, the better decision would have been to reverse course. After several attempts that resulted in the Cynthia Woods becoming more embedded, [Redacted] called [Redacted], a part-time captain with the Small Boat Basin, who responded immediately in the RV Parker. [Redacted] utilized the Parker because it was the fastest boat available and he was unsure if the tide would be too low for the Roamin Empire or the Milan. Again in hindsight, the decision to respond in a vessel that clearly did not have the horsepower to free the Cynthia Woods reflected poor judgment.

After several attempts by the Parker to dislodge the Cynthia Woods from the shoal, a private powerboat stopped to offer assistance. With both boats pulling on the Cynthia Woods, she was dislodged from the sand bar approximately two hours after running aground. The Cynthia Woods got back underway at 1700 and arrived at TAMUG at 1850. [Redacted] checked the tidal charts upon return and confirmed that the tides were running 1 1/2 feet below normal for this time of year.

In the process of freeing the Cynthia Woods, Robert Webster sustained minor cuts and bruises to his left hand when his hand was caught between a rope and a cleat. [Redacted] and myself followed up with [Redacted] on Monday, July 10. At that time, he had two band aids on his fingers, and his hand was a little stiff. A First Report of Injury was filed with HR in case experiences any further problems with his hand. The only known damage to the Cynthia Woods was a lost bow navigation light cover. The other vessel that assisted lost a cleat and sustained approximately $850 in fiberglass damage.

Recommendation:

The perceived causal factors resulting in the grounding of the Cynthia Woods are: unknown shoaling, ebbing tides and a deep draft keel. It is indeterminable as to whether or not the grounding could have been prevented. Nonetheless, human error in the form of poor decision making also contributed to this unfortunate event. Given [Redacted] ten years of service to TAMUG without any notable accident and the overall safety record of the Marine Terminal under [Redacted] direction, the grounding of the Cynthia Woods is not indicative of his skills and abilities as a . However, actions following the grounding cannot be disregarded. After reviewing the findings of this event, it is my recommendation that [Redacted] receive a verbal warning for not exercising better judgment following the grounding and that updated charts be placed on all Small Boat Basin vessels. As the Marine Terminal is currently short of charts, additional counsel will be given to [Redacted] by the members of the plenary council regarding the subsequent issues of the Marine Terminal and Small Boat Basin.

INVESTIGATING OFFICER
U.S. COAST GUARD
MARINE SAFETY UNIT
GALVESTON, TEXAS

CW 0000059
From: [redacted]@houston.rr.com
Sent: Monday, July 17, 2006 6:10 PM
To: [redacted]@houston.rr.com
Subject: Re: Cynthia Woods

Mr. [redacted],

I got an estimate to repair the damage to my boat (fiberglass repair), the cost to repair the fiberglass is $450.00 and additional $400.00 to buff & wax gel coat to match repairs for a total $850.00. I hope this is not too much. As far as gas goes, it's probably not that much about 5 to 10 gallons. I will mail invoice of written estimate for repairs. Thank you for your time.

Sincerely,

----- Original Message ----- 
From: [redacted]@tamug.edu
Date: Wednesday, July 12, 2006 7:35 pm
Subject: Cynthia Woods
To: [redacted]@houston.rr.com

> Mr. [redacted]:
> 
> Again, thank you for helping pull the Cynthia Woods off the shoals where she ran aground in the Houston Ship Channel on Saturday. We are very appreciative of all you did to get her off and for conveying the Woosley's back to our campus.

> Please send me an invoice (address below for mail or fax) for repairing any damages to your boat that were incurred during the rescue efforts. Also, just reply to this note with an estimate of the cost for the fuel that you expended. We are more than happy to compensate you for the damages to your boat and for the cost of fuel.

> Sincerely,

> [redacted]

> Vice President and Chief Executive Officer Professor of Maritime Systems Engineering Texas A&M University at Galveston P. O. Box 1675 Galveston, TX 77553-1675
> 409.740.4403
> 409-740-4407 (fax)
> [redacted]@tamug.edu
> www.tamu.edu

I HAVE SEEN THE ORIGINAL AND COMPARED THIS COPY WITH IT. AND FIND THIS TO BE A TRUE COPY.

INVESTIGATING OFFICER
U.S. COAST GUARD
MARINE SAFETY UNIT
GALVESTON, TEXAS

Enclosure: [redacted] page 2 of 2
Case # 406727
ECN 323 9402 - 010

CW 0000057
**GALVESTON YACHT SERVICE, INC.**

**P.O. BOX 385, 7TH & WHARF**

**GALVESTON, TEXAS 77553**

**PH 409 762 4927-FAX 409 762 0465-PH 281 488 2627**

**WORK ORDER**

**BOAT NAME** CYNTHIA WOODS

**REG**

**DATE** 3/12

**LENGTH** 38

**TYPE** Sail

**BRAND**

**CONST.**

**OWNER** TEXAS A&M

**PH.**

**ADDRESS** P.O. BOX 1675

**11075**

**FX.**

**CITY, ST, ZIP** GALVESTON, TEXAS

**PH.**

**BOAT LOCATION** TEXAS A&M

**ACCESS# KEYS**

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<th>ITEM#</th>
<th>WORK TO BE PERFORMED</th>
<th>DATE</th>
<th>ESTIMATE</th>
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<td>1.</td>
<td>Haul out and launch</td>
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<td>$380.00</td>
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<td>2.</td>
<td>Pressure wash hull.</td>
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<tr>
<td>3.</td>
<td>TEXAS A&amp;M will do all repairs</td>
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**TEXAS A&M UNIVERSITY AT GALVESTON**

**CELL**

MARINE TERMINAL MANAGER

(409) 762-4942
(409) 762-0465
FAX (409) 761-6339

**P.O. BOX 1675**

GALVESTON, TEXAS 77555

E-mail: umg@tamu.edu

**TOTAL ESTIMATE (ADD 8.25% SALES TAX IF REQUIRED)**

I HAVE SEEN THE COMPIRED THIS COPY WITH IT, AND AUTHORIZED BY FIND THIS TO BE A TRUE COPY.

INVESTIGATING OFFICER
COST GUARD SAFETY UNIT
TEXAS
PAYCO INC.

501 Búona Dr.
Galveston, TX 77554
PHONE (409) 744-7428

Haul Out
Date: 3-12

Boat Name: Cynthia Woods
Boat Type: Sail

LOA: 38'

Address: Texas A&M

2 - Micron extra fine (gal) 199.95 399.90

2 hrs to wash bottom w/waterwasher 45.00 112.50

(Refilled boat at travel lift to remove keel and hull 50.00

9 hrs labor to remove old caulking, bulb, still new caulking to keel @ drill attachment 45.00 40.50

3 hrs labor to sand & scrape below waterline 10.80

2 raths of bottom paint 10.80

1 - Catalux 216 Quart Thinner 6.99

I hereby request and authorize the above work to be done, along with the necessary materials to be furnished, and agree to pay for the same together with any expenses of the agents, officers and employees of the corporation. I understand that the work to be done is to be done in a professional manner and that the materials to be used are of the highest grade and quality. I further understand that the work is to be performed in accordance with the specifications of the corporation, and that the materials to be used are to be furnished by the corporation. I agree to pay for the work as and when performed, and to pay for all costs and expenses incurred in connection therewith, including any costs and expenses incurred in connection with the performance of the work. I agree to pay for the work as and when performed, and to pay for all costs and expenses incurred in connection therewith, including any costs and expenses incurred in connection with the performance of the work. I further agree to pay for the work as and when performed, and to pay for all costs and expenses incurred in connection therewith, including any costs and expenses incurred in connection with the performance of the work.

Haul Out 304.00

Parts 17.79

Total Labor 927.50

Water Wash 65.00

Paint 349.90

License 0.00

Miscellaneous 148.02

Outside Work 182.31

Tax 24.53

Total 1862.21

Billed 5-17-07
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<td>Rf. &amp; Cush.</td>
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<td></td>
<td></td>
<td>2&quot; J.A. (brush)</td>
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SALES TAX
148.00

RECEIVED BY: X

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INVESTIGATING OFFICER
U.S. COAST GUARD
MARINE SAFETY UNIT
GALVESTON, TEXAS

Enclosure: 015, page 3 of 2
Case #: 406727
ECN 32396004-013
Galveston Yacht Service Inc.
P.O.Box 385
7th & Wharf
Galveston, TX 77553-0385

Bill To
TEXAS A&M
PO BOX 1675
GALVESTON, TEXAS 77553
ATTN: [Redacted]

Ship To

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<td>REPAIRS TO THE VESSEL CYNTHIA WOODS</td>
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<td>000000</td>
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<td>000000</td>
<td>SERVICE DATE 3-12-2007; POWERWASH BOTTOM.</td>
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<td>50.00</td>
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<tr>
<td>000000</td>
<td>SERVICE DATE 3-23-2007; LIFT BOAT WITH TRAVEL LIFT TO REMOVE KEEL FROM HULL.</td>
<td>9</td>
<td>60.00</td>
<td>540.00T</td>
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<tr>
<td></td>
<td>INSTALL NEW CAULKING TO KEEL AT HULL ATTACHMENT POINT.</td>
<td></td>
<td></td>
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THANK YOU FOR YOUR BUSINESS.
GOD BLESS AMERICA.

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U.S. COAST GUARD
MARINE SAFETY UNIT
GALVESTON, TEXAS

Subtotal

Sales Tax (8.25%)

Total

Payments/Credits

Balance Due

Phone # | Fax # | E-mail
|--------|-------|---------|
| 409-762-4927 | 409-762-0465 | dawbergo@msn.com

Enclosure: 0 of 4
Galveston Yacht Service Inc.
P.O.Box 385
7th & Wharf
Galveston, TX 77553-0385

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| 00000 | **SERVICE DATE 4-3-2007:**
SAND AND SCRAPE SOME BELOW WATERLINE AREAS AS REQUIRED TO PREPARE TO PAINT;
APPLY TWO (2) COATS OF BOTTOM PAINT. THE BOTTOM PAINT WAS SUPPLIED BY THE OWNER. |
| | **MATERIALS INVOICE 13203.** | | | |
| | | 8 | 50.00 | 400.00 |
| | | | | |

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U.S. COAST GUARD
MARINE SAFETY UNIT
GALVESTON, TEXAS

Subtotal $1,653.31
Sales Tax (8.25%) $136.40
Total $1,789.71
Payments/Credits $0.00
Balance Due $1,789.71

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<th>E-mail</th>
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<tr>
<td>409-762-4927</td>
<td>409-762-0463</td>
<td><a href="mailto:dalbergoppo@aol.com">dalbergoppo@aol.com</a></td>
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Enclosure: 024, page 5 of 5
Case #: 4006727
ECN 3239990 - 011
# Galveston Yacht Service
PO Box 385
Galveston, Texas 77553
409/762-4927 281/488-2627
FAX: 409/762-3835

## Invoice

**DATE** | **INV #**
---|---
3/23/07 | 12203

### BOAT NAME
Cinthia Woods

### SHIP TO

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<th>SHIP DATE</th>
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U.S. COAST GUARD
MARINE SAFETY UNIT
GALVESTON, TEXAS

Enclosure: 1st page of
Case # 4Q 47227
ECN 339642 G-411

Thank you for your business.
VEssel INFORMATION SHEET

Name: cynthia woods
Home Port: Texas A&M University at Galveston

H.I.N.: UAR80071606
Radio Call Sign: WBA 7249

Owners Name: Texas A&M University at Galveston
Phone: 409-740-4862
409-740-4549
409-740-4547
409-740-4545

Address: P.O. Box 1875
200 Seawolf Parkway
Galveston, Texas

Builder: Cape Fear Yacht Works
111 Bryan Road
Wilmington, NC 28412

Model: Cape Fear 39 Regatta

Year: 2006
Length: 38 feet
Draft: 7' 2''
Beam: 11'

Height: 
Hull Color: White
Trim Color: Maroon

Number of Masts: 1
Mast Height: 51'

Propeller Size: 
Prop Rotation: 

Vessel Construction Material: Fiberglass

Engine Make: 28 Hp Volvo Penta
Serial Number: 1502173726

Oil Type: 

Fuel Tank Capacity: 20 gal
Water Tank Capacity:

Sail Number: 25438
Generator Make: 

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GALVESTON, TEXAS
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TAMUG employees should use the form at http://mnet.tamug.tamu.edu/fiscal/Direct_dep_inst.pdf

Student refunds processing through the Student Management Information System (SIMS) are not eligible for direct deposit.
This is Lieutenant commander, [redacted]. I am the chief of Prevention for Marine Safety Unit, Galveston. We are located at 3101 FM 2004. Today is June 11, 2008. It is approximately 10:13 a.m. We are interviewing Mr. [redacted], Texas A&M University at Galveston, was a crew members aboard the sailing vessel, Cynthia Woods, we have with us, [redacted] other, chief investigating officer marine safety in Galveston.

[redacted]: if you could begin by telling us about your experience sailing and your relationship with the sailing team.

[redacted]: I started sailing shortly after my parents own a boat when I was born and I have been sailing since, I was old enough to sail along my dad’s sailing vessel which is a CVC craft 37 for approximately 16 years. I sailed on numerous boats in Galveston, done offshore races several times. I have done the harvest moon approximately six times, 150 miles down to port ranges, done several short offshore races to just go out to local race and stuff like that then Regata De Amigos one time previous on the sailing vessel Cynthia Woods. I started with the offshore sail team in fall of 2004 and have raced every Regata that we have attended, racing on sailing vessel Revelly for the first two years and sailing vessel Cynthia Woods for remaining two years.

[redacted]: When you joined the sailing team, were there any requirements for joining?

[redacted]: We do have a physical requirement that you be able to move back on board, we followed by other crew members. We have turned people away because of their heavi ness, you have to be able to swim, I believe the requirement was 500 yards in direct water for 11 minutes. I passed the swim test in the fall of 2004, everybody passed that were pretty loose on physical activity because we get enough during sailing and the other requirements are that should attend practice every weekend.

[redacted]: What technique do you practice?

[redacted]: Practice begins Sunday promptly 1 o’clock. We meet at the boat basin on the dock depending on what boats we were taking out, we usually take out two, sometimes three, had been recently taking out all three. First at boats [redacted] will dispatch keys to unlock them, we will prep them for sail, uncovering sail covers, running the sheets, spreading the tides for the spinnaker. We will run an engine check once a month pretty much and we will check bilge for water then captain Jim will come and give us some briefing as we sign into the signing sheet saying exactly what he wants us to accomplish during the practice.

[redacted]: So there is a document of every practice.

[redacted]: He has written down on a sheet.

[redacted]: Okay and where is that sheet maintained you know?
As far as I know, personal office up at Oceanography.

Okay.

Once he has detailed exactly what he wants us to accomplish during practice. He may give some side notes to the sink skippers or the safety officers that are present.

Is there always a safety officer present there?

Yes, whenever we go to practice or race we have another safety officer on board.

Okay.

Once that is done he will depart the dock for his tracking in his office. During some practices he comes out and observes in the skiffs, but from there the safety officers and student skippers jobs the detailed practice out. We depart both basin and the safety officer always drives as we depart under the motor with the Cynthia Woods since the throttle is hard to access from the wheel always operate the throttle kept off the lines, come out, pull in the centers then once we find ourselves out in the canal with clear air, we will set sails and from there follow the practice diagram, which usually includes somewhere along the lines he wants us to practice about approximately 30 tacks or yards may be since sail changes for practicing with the spinnaker since October of last year we have not practiced any sail changes because of the spinnaker completely disintegrating during race. So it has been straight packing, jobbing, practicing maneuvers, and practicing safety maneuvers. Most of our practices in the beginning are safety maneuvers, maneuver drills and alike. Briefing the sails taking sails down in emergency and learn to use emergency equipment PBS/Radar/Radios #9.

You mentioned that you are the student?

Yeah.

Talk to me about how you get to be in a position?

When I joined in 2004 the team's was named and each year takes the most qualified as well as the most familiar person to skip on the boat to lead the practices for the students. It is my job to be the first person at each practice to report any problems we might have had problems I might have had personal to and to resolve most of the minor personal issues on the boats, the second year I was not student skipper, the third year I have began doing skipper on the Cynthia Woods because of my familiarity with boat as well as my job with I was working for him at the boat basin and my years of sail experience.
I take my job pretty seriously, I will also report you know maintenance problems although most of the time it is just small things. I had a problem with the turning buckle, it is ceasing, when we try and run the sheet through it we need to get some straight lubricants sprayed on.

When you would report any problems is there any log that you all use for that?

No mostly what I do is I come in after practice I will tell [redacted] sir I have a problem with this, he says okay well you come in and work on Monday, we will take care with that and usually Monday morning, since some of these morning he is meeting with the university upper ... and we will get it done, so we got them fix it. If there are items that needed to be purchased to fix it that is probably about the only maintenance log. However, the boat does have a log itself. He might be logging that in their ship's log.

That would be contained on the vessel.

It is contained on the vessel, but [redacted] himself I know he turns the log into the university itself so they probably have a photocopy.

Okay. You did the harvest moon last October and then you all did pretty well in your class?

No that was the sailing vessel Revel.

Okay.

We have been shaking out some of the difficulties with meeting or riding since we talked about the original rating was 42 and since then based on our performance it has been moved certainly higher so that we can compete better and in this last harvest moon I had a very good crew, although we went straight down straight distance and we got the calm for a while and so we came in approximately fifth in our class, but it was an improvement on previous year and so we can mirror better.

anything after harvest moon any Regata Amigos races, practices on the Cynthia Woods with that respect to Regata De Amigos.

Yes they were, past the harvest moon we take weekend to put the boats away where we take the sail, the racing sails off, wash them, fold them and put them in our dry storage area, put the practice sails, that our current sails back on, clean up the boats, the [redacted] usually hands out individual accolades, says congratulations, good job, we are going to take some time off, you guys focus on your studies a little more that is another requirement I forgot to mention you got to have at least 2.5 better to race with the offshore sail team.
Once that is done, we take may be two or three weeks off, may be one to two more practices after that before December, but as we get close to the holidays in fall we do not practice as much because we have final exams coming up. Once we get spring the first Regata we have in spring was the Hill Bank Regata in April 15, 2008 I believe it was, that Regata consist of approximately 60 miles, 30 miles out, 30 miles back to Hill Bank, which is you know oil rig on top of it and we did really well on that race, we took Cynthia Woods and we won first in class and first in fleet.

Best performance.

Yeah. Best performance. That was the last Regata we did for Regata De Amigos because the next Regata that we normally do the frequent triangle was on the weekend of finals and school will not let us race during weekend finals.

You have told about extensive sailing. You have been on a sailing vessel that struck something with its keel.

Yes.

So you are familiar with what keel is.

Exactly.

Do you know of any incidence such that on the Cynthia Woods?

Yes two prior incidences when we first have the Cynthia Woods, I did one of our inaugural sails we had and his and represented College station. We took them out for an afternoon sail with cattered lunch just to say hey here is our new boat, we are very thankful we have it and this is nice thing. On our way back I was sailing because I am familiar with the Galveston ship channel where the shroud comes out towards market and ... #11 as the shroud coming off the sweep caught a finger of that and ran a ground and tide came out and kind of put the boat on side.

We put the boat as the tide went out, the boat kind of lay down on the side, I insisted in the recovering of the vessel with some of the University's vessels and assistance we towed the boat off from side ways because of the deep wrapped keel and as soon as we got off the motor again captain Jim immediately have the boat repaired back to factory #6, passed where it was marked on the chart.

So this would have been what time frame.

Two years previous to this incident.

Okay. That was like 2006.
Yes it will be summer 2006.

Okay. Do you know where he did this repair?

It would be at the yard basin. Repair consisted of patching a spot on the keel where it had bent a little on the front and then the front valve hole had gotten bent during the towing.

Just thought to clarify bent, as it bent from left or from board to starboard bent?

No. A little piece somewhat leading edge at the keel got tilted this way, towards the port side of the boat, a tiny piece may be about 2 inches tall and after one side just gotten.

That was high up on the keel, was it?

It was right at the top of the keel joints of the boat, but it was further far enough forward away from where the boat moves in. That was when captain Jim first note know that was when he had repaired and tightened and the next incident was when we were coming out of the boat basin we hit something that we did not know was there. We huggd the shroud little too tightly and we skipped and it kind of chuged on it.

That was in winter?

That would have been winter of 2007, so probably January 2007 and that was when had the boat hold out for its first bottom job and we passed and faired the keel for that.

Explain passing through it?

When we hit it, we hit it with a bulb and the bulb got tilted so we patched the bulb with some mano to keep the shape and then we faired in the keel using fiberglass Interlux to bond it more to the surface of the both and create a better lift edge. It was by no means needed for structural, most of the racing boats though do this to generate a better lift on the keel.

Was there any damage to the keel itself?

No. None visible and we had a check over thoroughly.

There was no gap or it looked manufactured?

Oh. Yeah. It looked perfect to me then. That is all the grounding incidences that we had.
You said you had it checked over.

Yes.

And I know you are not in charge of the maintenance, but somehow you understand well it had been checked over?

When we have our keels checked over we have a professional team sometimes around, **[redacted]** who works at the basin is an engineer himself and that is what he is hired to do. He will come out, he has a full set of keel boots and door crunches to operate any type and down to exact factory specs. If it is in the yard we have the keel looked over by us usually and sometimes the yard people who are used to seeing this stuff. There is a Payco where we usually have our work done in there that looks over stuff for us and does some of the work for us usually on our shallow draft vessels and we if in the yard we check for gaps, we check for any leaks or pouring water in the bilge, fill it up and see if any that leaks out with some dye, see if any other leaks out down the keel if it leaks at all. We have patched around, it was 50 to 100 to make sure that it is completely sealed and then we faired it again and the last time I was out in the yard from our initial fairing job. We did this just after the keel fairing, we got to be pulled out coat bottom painting and repairing in the keel to improve the lift edge. We ground some other glass down to where it was smooth enough to bond to and sand it down or bottom paint around it, laid on new glass and new filler to create a better smoother lift edge and then re-bottom painted it and in that time we checked it to make sure there was not damage in any way that could be threatening.

When you are on a check, are you check just where the.

Where the keel bond to the deck on the outside as well as on the interior bulb.

On the interior as well. You said 50 to 100 which is a.

[redacted] silicon sealant water proof and hardens quickly.

What about the Bondo that was used on the bulb.

It is an Interlux product made specifically for this.

Okay. Do you remember the kind?

I do not remember the exact kind, but we have several cans that were stored in workshop.

And as far as the glass do you know the kind of?
I do not know the exact type of fiberglass, but I do know later on West Epoxy 105 Resin 205 fiber.

And you said West.

Yea. West is the brand.

Okay. When you will hold the boat out for ... who generally oversees what is going on?

oversees all the work on the boats and we have our own people that do the majority of the work people that we trust, get passes one of them under the person that works on them I am certain probably at some point. He is one of the other student skippers previous to me, but he works on, he sails on Revely primarily.

How many of these people that you are naming here has sailed Cynthia Woods and worked on Cynthia Woods?

They sail on it, but they work on it.

Okay.

And they work on it because they work for and because they have extensive experience, knows fiberglass because he used to do it on our power boats, he is a very good painter for specific paint jobs as well as fiberglass has waived entire power boat hull and knows the job very well. is hired by the University, does engine maintenance on the Roman Empire and The Romulan as well as all the sail boats and does a lot of remainder fixing jobs, knows welding, glassing, and many things, he is very at his job.

Who would be the person if you know right under?

Right under would be.

Okay. We got a report of some water ingress into the vessel like prior to we got as it was in require of some repair, do you know anything about that?

Yes. That was the hell bank reda we came down the boat in the morning, started the engine and realized that we have got a bad rains the day before, opended the engine compartment had a substantial amount of water in it, we pumped it out because we know visible leak, so we assumed it had leaked down from the drain in the cockpit, so we pumped it out and checked everything over me.

and several others looked out to make sure that there was no visible leak and I could not find anything and so I was under orders that yes I can depart for the race and so as we moved out we noticed that it was still leaking a little, but it is very little, I
mean tiny amount so not enough water to where we could not keep up with it at all with with the bilge pump this is really small. We started the race, finished the race and the next Monday morning I notified [redacted] checked it over and found where it was leaking and made the engine carbon-sulfa sealed in such a way that nothing can drain out so he made hulls we can drain directly into the main doors if it could be pumped out. From there, it was hulled out I think two weeks later.

[redacted]: Do you know where it was coming in from?

[redacted]: Yes. We found the leak where the out drive sits on the boat becomes out to the deck as a cavity, on the exterior of the cavity is a plastic gasket to keep going marine life from getting in there. They have used I believe was nine stainless steel wood screws and washers around outside of it, but instead of drilling into the cavity because there was a lip around the edge where they could drill straight into the cavity, they drilled into the fiberglass and one of those screws had fallen out. We found this in the yard, removed the gasket, patched all the holes with fiberglass and West Epoxy to seal them up and moved all the screws inward to the cavity so that they could no longer leak into the boat at all even if it is allowed.

[redacted]: Okay. I interrupted you, my apology…?

[redacted]: Yes, [redacted] had it hauled out in early May.

[redacted]: Of this year?

[redacted]: Of this year and it is at the Galveston Basin Yard there for I guess about two weeks where we sand it down and glass the … like I mentioned before and we put new bottom coat on it as well as put new instrument package on it for sailing.

[redacted]: You all were doing this work, was there any notice of varying cracks or anything in the glass?

[redacted]: None that I saw. Glass was in as far as I can tell perfect shape. There was no blistering and no cracks.

[redacted]: What about inside?

[redacted]: Inside there was nothing major, a little splintering of the glass on top of some straps, but it was mainly because it was loose glass, it was mat, not weave and that comes up if it comes a little tough to that and that is normal because you layer the glass, it goes weave, not weave, not, and you alternate between thick weaves and tight weaves and if you finish off the layer of mat you always get a little you know few fibers that come off, but nothing structural.

[redacted]: No re-lamination and …
No. I know what to look for in a bit like that blistering is the key, which you look for especially on new fiberglass because if there is any gap water to get in there, the fiberglass will blister up and delaminate and you will get a spot where you have to chisel out, grind out, and it will literally come out and just drain water and there was none of that present after a year and if it is good for a year, it is perfect at that point.

So this is in May of 2007.

May of 2008.

May of 2008.

May of 2008.

Yeah. Just last month.

And that when you pulled it out in May of 2008, did you get bond of the bulb also or not?

No. This is strictly at the joint, we took the previous glass ingesting was in good shape. We ground down the first layer to make it smooth and grippable for the new glass came in with bond of fairing to give it a curvature for the water for better hydrodynamic shape then came in with more glass that I think it was two to three more layers of glass on top of it before we had all that requirement previously.

So how many layers total?

Probably about six layers total in this, after everything set and done.

When you all do repairs … who has the final say so what to be done?

Okay.

And you know he has never missed anything on repairs that I have ever seen, in fact sometimes he does think that I think a major we overkill for a race boat, but it has been just to make sure that there will not be a problem again.

Okay. Do you have recollection of any incidents where for example, you might say when you need to do, says which would be?

As a matter of fact there have been several circumstances and that he explains exactly why and I am quickly proven wrong about what I was supposed to be doing.
Not looking at right or wrong.

Well no, but he has there got point every time he does that, in fact in March, the position was the rudder, I mentioned the rudder had a tearing issue originally with the boat where it was a rod system with an armature loose back like this. If you move the wheel over too far and force it, it could go and pop and reverse the steering. The solution was to put rudder stops on it to limit the rudder turning and I would have just put a stop to limit the armature from flipping so that we can continue having steerage. The solution was to have pieces welded up and through bolted through the bulk end toward the armature could only move direct certain amount and his explanation was if you are turning the wheel that far over the boat is overbalanced and needed to be reducing sail to keep sailing up.

When did you have discussion of external inspections of vessels?

External inspections, I know coastal guard safety inspection on it. We have all our boats that we can get coast guard safety inspections.

You said safety, define that?

Making sure that we have fire extinguishers, life rafts, harnesses, life jackets, paddlers not required, but we have, man overboard boats, life rings that kind of stuff.

Who does the inspection?

I have never actually been there for coast guard inspection, but I see them on that boat quite often for vessels.

Where they have been?

That would be in office the boat division. We had just white board, and he just writes things, coast guard inspections 3900.

When you get a race.

Yeah: We get the race the stuff is up.

An issue I had with that hoping is just to lay it out here for you... it is an un-inspected vessel someone they do coastguard exilery because one thing that we have to look at in this investigation is whether or not that vessel should have been inspected on a regular basis before a true compliance as a school ship or sailing ship, if there were some specific requirements. At this point the vessel has not been inspected, but it meets all the
criteria for the same and by definition where you guys do is, I mean it could be in either way, but it seems preliminarily that you guys are under some type of instruction you have task that you need to accomplish and that you are working toward.

Well, I will tell you this that these boats have to comply under type 2 offshore racing requirements and that means that they have to have a certain level of safety and security before they will be allowed to sign up in these races.

Then who ensures that compliance?

Usually the racing federation that we have PHRF. They do measuring of boats and sometimes the yacht clubs that sponsor the races do these things. I remember the first step is, one of the requirements of offshore racing is now they wanted to have open life lines and vinyl code stuff because the older boats, the vinyl code stuff actually make the rod that you cannot see the rod. However, we have had problems because we only have had the boat two years, ours is in very good condition and they came down, inspected and said yes there is a waver for having that.

... 46 code of federal regulations and I came correct any time there is a repair, anything altered on those vessels he qualify a marine inspector if it were classes sailing school ship would have to prove those prepares, officer have to be notified, so that is the limit that we were looking at and no fault to be assigned, we should know when we have vessels of that nature in that area.

Yeah.

I am just curious as to when we do alterations and you said it is done through manufacturer's specifications.

Upon need, yeah.

From what you, I hear one name that is and I have no reason to think that he is not doing everything as per manufacturers spec. There is not a check behind him is what I am understanding.

No for the most part there is not any check behind , however, has more than enough years I think it is at least 30 to 40 years of experience as far as sailing boats. And that is quite an experience and then on top of that he has his certification.

Understand. The larger vessels the motor vessels that are right there in the basin, those vessels are certificated by coast guard.

Okay so that may be the only vessels we do, but I know that with those vessels we always have the certified, I mean including new plans on them yearly.
Okay, right.

Yes.

You brought up PHRF.

Performance Handicap Racing Federation.

Do you know they inspected the vessel before they...

I do not know, but they do require us to be in compliance to type 2 offshore racing.

Okay, We will take a look at this.

Yeah.

Self certified.

Yeah.

Let's go through, let us say the time from May until we are getting ready; take this from to pull out in May to getting ready for the Regata De Amigos.

Okay. I worked until the week before graduation in May on the sailing vessel Cynthia Woods namely sanding on the keel to make the prep the area where the glass with the existing validated bottom paint.

This was at Galveston Yard Basin.

Yes, at the Galveston Yard Basin, we hulled out. I think it is down approximately 12 inches down this way, 8 inches out this way from where the keel joins up at the boat to prep the area for new glass.

For the purpose of the recording.

12 inches down from the hull where the keel joins with the hull.

12 inches vertical.

An 18 inches horizontally up the side of the hull from where the keel and the hull join together. At that point that took approximately two days then allowed me to assist him in the removal of the Ockam instrument package, which was previously installed in the boat, but was not working and had not been working correctly. Its sailing strengths with depth and wind speed and boat speed, we removed them, had recently purchased a new Tacktick boat instrument package for the boat.
wireless system that we induced before that is very reliable. I removed the Ockam instrument package, boxed it and sent it back to [REDACTED] office, presumably we were going to auction it, training one who wanted to buy them school's auction, which is a standard operating procedure for anything of that extends. After that I quit my job at the boat basin, graduated and began working for APM terminals. I have limited contact with [REDACTED] other than just basic administrative stuff, I came down.

[REDACTED]: Where would you have stopped, you said after I am just trying to clarify the time.

[REDACTED]: Graduation in May.

[REDACTED]: Graduation was.

[REDACTED]: Graduation was May 10, 2008. I quit before the weekend for the week of finals that would be May.

[REDACTED]: May 1, 2008.

[REDACTED]: May 1, 2008 I think was.

[REDACTED]: Okay.

[REDACTED]: The next contact I really had with [REDACTED] personally was when I came down three weekends ago to the boat basin to put the racing sails on to go over the boat and go over the safety plans.

[REDACTED]: Okay. Let me stop you here I just want to clarify. May 1, 2008 when you pretty much downward, where was the boat still out?

[REDACTED]: The boat was still in the boat yard.

[REDACTED]: What was the status of the work did you, was everything, I am just trying to give.

[REDACTED]: We had sanded down the keel. We had put the West Epoxy on it and put the initial coats of glass on. We had not done bottom paint yet; the rest of the boat was getting sanded in fact for that.

[REDACTED]: Okay. So did you all working shifts or what would be like everybody comes out work for eight hours, everybody departs.

[REDACTED]: Some workers work in shifts.

[REDACTED]: Okay, so you were not there for all other work day.
No, I was not.

Can ... 

I was there for approximately four hours Tuesday, Wednesday, Thursday each week four hours Tuesday, four hours Wednesday, four hours Thursday as my class schedule allowed. I like to do the work when I was there and because I knew boats very well because we had known each other since I was there, but in this case we did not have that luxury because we were prepping for racing and yard cost quite a bit, so he had [REDACTED] and [REDACTED] who is a contractor with the boat basin, who has been working with us for quite some time.

Yes and both of them since my entire time at the Basin did good work, they did the other half of the work while I was not there as well as some of the other boat basin workers, student workers that were there I do not know all their names, but if they were not experienced enough [REDACTED] would never put him on a project... something like that. Very few actually did any other glazing work, me and [REDACTED] primarily because we knew and had done it previously. I have done plenty of fiberglass work in my boat for bulk heads and stuff.

That gives us you were working towards that.

Yes. At that point I quit, was on the observation to start my professional job at APM Terminals. Certainly that is paying job. I enjoyed my job with boat basin because I like working with boats. I have raced in, got on another person's boat that [REDACTED] briefly at after a party to pickup the trophies from Hill Bank Regatta and then saw him I believe was the next Saturday when I saw him next, where we went put the racing sails on the boat and then [REDACTED] went over the detail racing plan as well as the safety plan, which included watching a life raft video and that was for Hill Bank Regatta that we watched the life raft video. He went over everybody's instructions for who that want if the boat was going down. Two people were signed to get the life raft and one person was assigned EPURP and one person was assigned ditch bag. He also went over our positions on the boat designating student's skipper you guys are crew, use your safety officers, here is the change of command, safety officers come first and if they differ from what they are talking to the students you follow what the safety officers says.

He did mention, he was expecting the majority of us to attend the safety seminar at Lakewood Yacht Club before the Regatta they put on approximately an 8-hour safety seminar about things that you can happen see in the gulf detailing everything from extreme sunburn, dehydration to eye troubles from the reflection of the water. I do not attend the safety seminar because of work, but I had attended to the safety seminar.
Yes, I had attended safety seminar as well two years ago.

Okay. From the time that we were in bay and boats all that and will give them back to the small boat based what that to your knowledge was that pulled out, put back in the water sail right back.

Yes they would have been put it back in the water and motor it back to the low basin.

Any tests or work ever been done just to take it out?

We did not have a chance to do a shakedown sail.

It was after that you typically will do?

Not really. Since we practiced a lot during the year, if we do any work during the year, we get a chance to shake it out the next weekend, but the majority of our work is done during the summer or in the spring during the spring break because we need to, we only get one practice each week and we try to keep close this operation as possible unless there is a major defect and you know a major problem something that cannot wait and we to find that pretty loosely as I would say the major problem for us on another boat would be a minor problem.

Okay.

Yeah, so.

Give me an example what.

Okay, we will let the screw that came out.

Okay.

A tiny bit of water leaking in easily covered by the bilge pump, another boat would sail. I do not think on any extended races, but the bilge pumps keeping up just fine. It only runs may be once every 30 minutes and we had that hold out immediately after the race.

Okay.

As soon as we could arrange for both the year time and paint, we did sail with after that either.

Just to clarify something From the time it was dropped in the water until it was brought to boat basin, from what was Galveston.
Galveston yacht basin.

: From that time you were on that job?

: No, I was not. I was working at the other job, but probably about a 30-minute motor from the Galveston Yacht Basin to Galveston to the A&M Boat Basin, so it had substantial time to be under water and be under water pressure.

: And it is going to be, would be in the water.

: Yeah.

: The previous time that you took it to the Galveston Yard Basin that you but at school, took it to the Galveston yacht basin was it two years ago?

: One year ago. We tired to do bottom job every year sometimes we miss it, but unless there is a major problem we do not worry too much about it. It is just bottom paint to keep fading off. If we see a problem and it is something we have to correct by holding it, we will hull out.

: Was it January 2007?

: Yeah, I do not want to say it was because it was pretty cold.

: They have run the ground in the Galveston Yard Basin.

: Not that I recall. I was on the boat, but he went it, but I was on the boat when he came out, the engine product back to the boat basin and it did not run the ground.

: Okay. But it had previously run the ground.

: Yes.

: Okay,....

: As much as everybody else I want to know exactly what happened.

: So now we would still prepare to know, but I do not want to drag you if we can walk through regada de amigoes previously.

: Okay Friday morning, got up at 6 o’clock, had my bags packed, departed, went straight down to Galveston, my [redacted] dropped me off. I was the first one there, but [redacted] was at his other office as I recall. I set my bags in the cockpit and waited for everyone else to get there. They got the bags down, [redacted] came down having the keys, he unlocked the boat with his set of keys, I still ... and began
preparations for getting under way. We led the jacklines for our harnesses and tethers since I had not been to boat previously that week. I pulled a tether for myself. I have that self inflating harness/life jacket, so all I need with the tether, set my ear down made my bunk and then began removing sail cover and wheel cover, turned on the electronics clipped in the wires with electronics, they have clips where they hang on in the cockpit equipped in. and the rest of the crew were there by then we put on the sail that had sail and hold it up on to the roller froiler. Then brought down a few more waives fresh designed, officials stuff from the University. We signed, and us went and retrieved all provisions, me and stored them in the boat in specific places.

Waives, what kind of waives they?

: Not really sure, honestly speaking.

: takes those.

: takes those, they are on file.

: Okay.

: All of the waives which we signed.

: Sorry for the interruption.

: No it is fine, I understand, it clarifies. Me and Roger Stone stored all the provisions.

: Okay.

: We had enough provisions, I say for a small army for about a week.

: Okay.

: But that's he takes really good care of us, put on the water. Water tanks on the boat were already full. had done that two days previous.

The fuel tank was full and me and Roger Stones spent a lot of time balancing the weight out in the boat for racing, trying to, we knew pretty much what tackled beyond majority of the race and tried to remove as much weight to the high side of the boat as possible that we could keep it off the low side the boat was now riding correctly.

So we get some max speed.

: Yes max speed and max balance in the boat. Once we had that all that in place and sealed everything up, brought down lunches for us, he had for long
stuffed sandwiches for us to eat and water obviously. We went and drew T-shirts, tank tops, and puller shirts and hats as official gear for the race from the University to be worn at the after-race parties each have Texas A&M University Sail Team and see from there we had pictures taken by, he was down the lane, took all the pictures, I was on the boat there. gave us a final safety briefing about who had what assignments when and if we went aboard as well as at 6 o’clock we come on wash if you are on the 6 o’clock all through the night better have your harness or life jacket on, make sure that the emergency release is on me and closes to you, it does you no good if its on the other end, listening to your safety officers at the boat fields, overpowered and fields were uncomfortable. There is a change needs to made, do not go over 30 degrees of heel instead of 30 degree of heel on the area set with you, try if you are going forward during the day, stay clipped in and refresh often. He gives us standard speech as far as everything that this is the special basically.

When you all around the vessel below. Do you have to have on life vest.

No, that is another safety precaution we follow if you are below the vessel do not be wearing a life jacket because if the vessel does what it did, you cannot get out because you cannot swim down now and out that is something I had been taught since I was little and that’s something that just about every sailor follows, but when you come on deck you better have that life jacket on, that harness on of its day, if it is not done.

You have how many other life jackets I understand that everybody has their own.

Yes everybody bought their own private life jacket, most of us bought private life jacket with harnesses. They are expensive, but there are worth by every means. The only person who did not have his own personal life jacket and harness was just enough, he used a school life jacket and a school harness. He had those on when he went overboard and everybody else watch that was off, had theirs stored next to them and I was actually sleeping with mine next to me as I had it with since I woke up.

You were taking pictures?

We were taking pictures and gave us his final safety meeting and then said good luck, we will see you down there. We detailed, he did give me a copy of the hotel reservation just in case we got there in the middle of the night and we put those at the ship’s folder and from there me and sat down below and discussed the tactics of the race; however, how we are going to do and what the other boats were predating to do and then at approximately 12:30 we got underway, motored out to the Galveston ship channel. He is in the ship down to Galveston channels set our sails.

The safety officer will be guiding as well?
Yes. They guide us out at the boat basin from there I drove some. I will let the other guys drive some because they did not have as much wheel times some of the rest of us and give him a good feel for the boat, a good experience for the boat. Once we got up there we set our sails, got the boat in tune, reached it down for about the Jibb you have got it, called the cards they are right on the Jibb, so it was drawing effective getting the maximum speed and checked the weather to make sure the boat was balanced right because we did not want to have too much rudder on, it slows boat down and some sink. You do not have much steerage. We got the rudder status right up got the boat in balance, the other boats were gathering. We checked in with race committee approximately 1:30 checked in with race committee on Channel 68 and we sailed around, sailed up, sailed down, got bearings on the starting line, check in, set height of the other racers that were coming by, we knew lot of them, first start was the racing spinnaker class and cruising spinnaker class that gun went off at 2 o’clock. Our gun went off at 2:05 and the final class to go off was the multilevel class with one boat. We were making aware of the channel we had already planned to be heading out away from the shoulder. I had mentioned previously we have that well documented now went outside towards marker #9, sailed and then went for 5A out the jetty. Set up on course 183 approximately to get out we made one tack basically and then we round course and in the crew Roger Stone drove after the start and I drove at the start of the race and drove us out past the show and then Roger drove the majority until our watch started at 4 o’clock, started watches at 4’o clock that afternoon. I took a look for Roger at 4’o clock as he had been driving about an hour and I wanted him to get fresh eyes on it. Drove for about an hour-and-half then put down on the wheel showed a few finer points on how to drive with the wave action we had because it was knocking you we have to be proactive on alone to keep those speed up. He drove for probably 45 minutes to an hour. Roger took over again and then I drove to the end of the watch.

And then what is in to your regulation when.

Close to 8’o clock.

On Friday.

On Friday. The off watch at 4’o clock went down and went to sleep that we want to make sure we rested for the 8 to 12.

Okay.

The reason I volunteered for the 12-4 was because I had been working nights and was probably the fresher for that watch I was used to it already and working from 5 ‘o clock in the evening until 6 o’clock in the morning I already a night owl away.

You said you drove until 2000 hours.

Yeah 2000 hours.
Who did you turn the vessel, who?

took over after me. I believe it was. No, no wait a minute, I drove and then Roger took over to the finished watch that it was. I took over after and Roger drove to the other watching. He turned it over to the . I am sorry for that.

Okay. Did you talk to when you guys watched it.

No I talked to the other two students and Roger did watch change over and because Roger was the PIC at that point and they gave him you know here is where you are sailing, here is the average speed and here is the way actually were experiencing when this has been approximately this, have considered letting out little more sail to improve our speed, some of the other boats were doing that and then he said came low side and got him behind Roger where he is sitting up high side of wheel is, Roger is sitting approximately in front of the wheel. Steve got behind Roger, looked all the instruments, checked all the gauges then took over. Roger waited for a minute or two while got comfortable. The other two guys clipped in with their harnesses that was a little early for it, but they clipped in anyway, so they didn't have to go down below and get in and then we went off watch, got something to eat or drink and went to sleep.

During you watch from the start to about 2000 hours, did you notice anything with the vessel.

No, I noticed a creaking sound, but I identified that when I went down below, with the life raft was on the mast, it was kind of sliding up and down a little when the boat hit waves. So it was vallese bag was creaking a little bit.

Did you tell anybody else about it?

Yeah, I mentioned it to Roger and I mentioned it to . Is what that sound it just to check on guys, you know no worries or if you hear anything out of the ordinary, I told if you hear anything out of the ordinary, do not keep it quiet.

Then you go to sleep.

Tried it. I never really sleep well in the first watch especially because I am working nights anyway.

Okay.

But I cap napt.

Okay.
And I get up periodically. I used to hear once and check the downstairs CPS, check our speed course and heading and distance from number #1 and then I gotten out probably from about 10 to 11:30, wake there, decided, hey it is time to really get up about 11:45, so I peep down, grabbed harness, was laying next to me then I realized there was water bubbling up like sea level down. I said hey Roger we got water, Roger pops he was in the quarter berth on the high side, pops up, looked down and says gets out boat and switched all lights checked out this. Hey we have got water, start motor, let the sails go, so immediately started the motor and got ready to dump the sails, but at that point.

Just gone back.

Yeah.

You pulled up flow boat.

I was getting ready to pull up the flow boats when he mentioned when he let to is started motor and gets up in the wind.

Okay.

I pulled up the flow boats as I pulled up the flow boats it just came flooding out. I swam the flow boat back down and the lock in placed, hooked stem the tides, but it did not do any good at that point. I think personally I think what happened was the bolt that at point had come loose from keel.

What will make you think that? Did you see where it is coming from?

I can still see some of the boat intact and I think when I loose it up and ready for pop up free. The bolts come up that part in the flow boat except for the first was come short may be about an inch-an-half shorter. There are pretty tall and have washers underneath them and I threaded and I got a huge lock not on the top of them with a lock type on it and in reconstructing it while we were floating out there with talking with he said this is what I think after that he hearing any ripping.

I did not hear any breaking and I did not hear the boat shear that makes pretty loud racking when they shear off. This is the only thing that I can come up with if they can loose from keel and slip that off, but...

What he just gone back to keel, what did you see when you pulled out, did you see the bolt?

Water and the dark shape that I assume to the most, because the lights were already on inside and I could see clear water and I could see the dark shapes underneath of it and there is nothing at that part other than the bolts.
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Galveston, Texas 77554
PHONE (409) 744-7428

WORK ORDER

2757

Head Date: 4-22-

Order: 1

Owner: Texas A&M

Address:

City: ___________ Water: ___________ Telephone: ___________

Load: 38' Boat Type: 50:1

PO# L8438 53

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I hereby request and authorize the above work to be done, along with the necessary materials to be furnished, and agree to pay for such work and materials, at your usual and customary rates, as mutually agreed to be paid at the office of PAYCO, 551 Blume Dr., Galveston, Texas, and, in addition to any Bane, rent, or other right or interest held by you, to the satisfaction of PAYCO. All charges for labor, material, and equipment are shown above. Your order is to be taken by this order, unless otherwise stipulated. The undersigned is responsible for the correctness of the above work and materials to be furnished. If any work or materials, such as labor, equipment, or both, is not used properly, the work and materials, including labor and equipment, are to be paid for at the rate charged, unless otherwise agreed to in writing by the undersigned. Any changes for labor or equipment, including labor, are to be paid within 10 days of the invoice. The undersigned is subject to the agreement of the work and materials, including labor, as listed above.

I have seen the original and compared this copy with the original and agree to the terms and conditions.

INVESTIGATION FOREMAN:

GALVESTON, TEXAS

Further hereby grant PAYCO and its agents, contractors, and all laborers and employees, to enter upon this premises or any other premises where such work or materials are to be placed, subject to approval of authorized person. Any changes for labor or equipment, including labor, are to be paid within 10 days of the invoice. The undersigned is subject to the agreement of the work and materials, including labor, as listed above.

Further hereby grant PAYCO and its agents, contractors, and all laborers and employees, to enter upon this premises or any other premises where such work or materials are to be placed, subject to approval of authorized person. Any changes for labor or equipment, including labor, are to be paid within 10 days of the invoice. The undersigned is subject to the agreement of the work and materials, including labor, as listed above.

Texas A&M Galveston

Enclosure #12 page 6 of 4
Case #: 4007 531
ECN 32 390 43 013
Galveston Yacht Service Inc.
P.O. Box 385
7th & Wharf
Galveston, TX 77553-0385

PAYCO MARINE, INC.
361 BLUMEN DRIVE
GALVESTON, TEXAS 77554

PAYCO MARINE, INC.
361 BLUMEN DRIVE
GALVESTON, TEXAS 77554

<table>
<thead>
<tr>
<th>P.O. No.</th>
<th>Terms</th>
<th>Official Number</th>
<th>Brand of Boat</th>
<th>Length of Boat</th>
<th>Location of Boat</th>
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<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Hrs./Pl/Qt.</th>
<th>Rate</th>
<th>Amount</th>
</tr>
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</table>
| Haul out 36-50 Sail | SERVICE DATE 4-22-2006;
HAULOUT AND BLOCK;
SERVICE DATE 5-2-2006;
LAUNCH. | 36 | 10.00 | 360.00 |
| Labor (Laborer) | SERVICE DATE 4-22-2006;
LABOR TO POWERWASH AND SCRAPE
BOTTOM TO REMOVE MARINE GROWTH;
2 MEN @ 22.5 HRS. | 4.5 | 50.00 | 225.00 |
| 00000 | SERVICE DATE 5-1-2006;
LABOR TO MOVE STANDS TO ALLOW FOR
CREW TO COMPLETE BOTTOM PAINT JOB;
2 MEN @ .25 HRS. | 0.5 | 50.00 | 15.00 |

THANK YOU FOR YOUR BUSINESS.
GOD BLESS AMERICA.

I HAVE SEEN THE ORIGINAL AND
COMPIRED THIS COPY WITH IT, AND
FIND THIS TO BE A TRUE COPY.

INVESTIGATING OFFICER
U.S. COAST GUARD
MARINE SAFETY UNIT
GALVESTON, TEXAS

Subtotal
Sales Tax (8.00)
Total
Payments/Credits
Balance Due

Enclosure: 01/3, page 2 of 4
Case # 2006-727
ECN 333 90 42 - 73
Galveston Yacht Service
PO Box 385
Galveston, Texas 77553
409/762-4927  281/468-2627
FAX: 409/762-3035

Invoices

<table>
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<tr>
<th>DATE</th>
<th>5/2/08</th>
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<tbody>
<tr>
<td>14459</td>
<td></td>
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</tbody>
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BOAT NAME
CELESTIA WOODS

P.O. NO.

DUE DATE
5/2/08

REP

SHIP DATE
5/2/08

SHIP VIA

POB

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<td>18748</td>
<td>2M 06780 SCREWLOCK</td>
<td>1</td>
<td>30.98</td>
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I HAVE SEEN THE ORIGINAL AND COMPARED THIS COPY WITH IT, AND FIND THIS TO BE A TRUE COPY.

INVESTIGATING OFFICER
U.S. COAST GUARD
MARINE SAFETY UNIT
GALVESTON, TEXAS

Thank you for your business.

Total
630.98

Enclosure: 1 of 4
Case # 7816-76-7
ECN 3239 (E-2) 913 2-913
Galveston Yacht Service Inc.
P.O. Box 385
7th & Wharf
Galveston, TX 77553-0385

PAYCO MARINE INC.
501 BLUME DRIVE
GALVESTON, TEXAS 77554

PAYCO MARINE INC.
501 BLUME DRIVE
GALVESTON, TEXAS 77554

<table>
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<th>Official Number</th>
<th>Brand of Boat</th>
<th>Length of Boat</th>
<th>Location of Boat</th>
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<table>
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<th>Hrs./FLG.</th>
<th>Rate</th>
<th>Amount</th>
</tr>
</thead>
</table>
| Materials| MATERIALS INVOICE 14439. 
NOTE: SOME ADDITIONAL CHARGES MAY BE DUE FOR LAY DAYS. | 30.95 | 30.95 | |

I HAVE SEEN THE ORIGINAL AND COMPARED THIS COPY WITH IT, AND FIND THIS TO BE A TRUE COPY.

INVESTIGATING OFFICER
U.S. COAST GUARD
MARINE SAFETY UNIT
GALVESTON, TEXAS

THANK YOU FOR YOUR BUSINESS.
GOD BLESS AMERICA.

Subtotal: $660.95
Sales Tax (0.00): $0.00
Total: $660.95
Payments/Credits: $0.00
Balance Due: $660.95

Phone #: 409-762-4927
Fax #: 409-762-0463
E-mail: dalbergapo@aol.com

Enclosure: 013  page 4 of 4
Case #: Hidle 727
ECN: 323 4602 - 013
STATE OF TEXAS  
COUNTY OF GALVESTON

I, [redacted], M.D., Deputy Medical Examiner, do hereby certify that the within and foregoing is a true and correct copy of the Autopsy Proceedings had on the body of:

ROGER WINSLOW STONE.

Witness my hand at office in Texas City, Texas, this 5th day of September, 2008.

[Signature]
Deputy Medical Examiner

Subscribed and sworn to before me this 5th day of September, 2008.

[Signature]
Notary Public, Galveston County, Texas
THE COUNTY OF GALVESTON
MEDICAL EXAMINER'S OFFICE
6607 Highway 1764
Texas City, Texas 77591
Phone: (409) 935-9274
FAX: (409) 935-6308

M.D.
Chief Medical Examiner

M.D.
Deputy Medical Examiner

M.D.
Deputy Chief Medical Examiner

M.D., J.D.
Deputy Medical Examiner

AUTOPSY REPORT

NAME OF DECEASED: ROGER WINSLOW STONE
CASE NUMBER: ML-2008-317
AGE/RACE/SEX: 60 years/White/Male
TIME/DATE OF AUTOPSY: 0900 hours, June 9, 2008
PROCTOR: M.D., Deputy Medical Examiner
REQUESTING AUTHORITY: Article 49.25, Texas Code of Criminal Procedure

DIAGNOSES:

1. Drowning.
2. Decomposition, early.

CAUSE OF DEATH: Drowning.
MANNER OF DEATH: Accident.

M.D.
Deputy Medical Examiner
Galveston County, Texas
The body is examined in the Galveston County Medical Examiner Office, Texas City, Texas by [redacted] M.D., Deputy Medical Examiner after receipt from Galveston Mortician Service on June 8, 2008 at 2345 hours.

It is performed on June 9, 2008 at 0900 hours. Assisting with the autopsy are [redacted] and [redacted].

Clothing:

The clothing consists of khaki shorts with a black belt, white T-shirt, and white boxers. There is a long yellow nylon type rescue rope across the upper part of the body around the axilla and anterior to the neck.

External Examination:

The body is that of an adult Caucasian male appearing to the stated age of 53 years, measuring 67 inches and weighing 215 pounds. The body is in the state of early decomposition characterized by generalized green discoloration, more so over the face and upper chest, generalized marbling of the veins with green discoloration, variable epidermal slippage and epidermal vesiculation, slight foul odor, and early bloating. The head is covered with brown hair with some gray measuring 2-1/2 inches. The eyes are pale brown with round and equal pupils. There are no petechiae. There is subconjunctival postmortem suffusion of decomposition fluid. The nose and ears are intact otherwise. The mouth shows natural teeth. The oral mucosa is otherwise intact. There is a red-brown with some white-gray mustache and full beard. The neck is symmetrical with no masses palpable.

The chest is symmetrical and hairy. The abdomen is distended. The pubic hair is red-brown. The penis appears circumcised. There is postmortem distention of the scrotal sac.

The lower extremities are symmetrical. The right leg in the proximal part anteriorly shows abrasion incorporating a small contusion.

The upper extremities are symmetrical. The palmar aspects of the hands show epidermal wrinkling.

The back does not show any evidence of trauma or deformity. There is decomposition change.

Internal Examination:

The chest and abdomen are opened by the usual Y-shaped thoracoabdominal incision. The chest plate is removed.
The subcutaneous adipose tissue shows early decomposition change and measures ⅕ inch in thickness. The peritoneal cavity does not show any abnormal collections of fluid. The lining surfaces are smooth and slightly dull. The appendix is intact. The pectoral muscles are soft beefy red. The rib cage is intact. The pericardial and pleural cavities show smooth lining surfaces. The pleural cavities each contain up to 200 milliliters of early decomposition fluid. The pericardial cavity shows a few milliliters of similar fluid. The diaphragm is intact.

The heart weighs 270 grams with moderate amounts of epicardial adipose tissue. The epicardial surface is smooth and glistening. There is early decomposition change with soft consistency. The coronary arteries do not show any significant atherosclerosis. The cardiac valve leaflets and cusps are otherwise unremarkable. The left and right ventricles are of average normal thickness. The interventricular and interatrial septums are intact. The myocardium is uniformly brown and there are no focal lesions. The aorta and its major branches are intact and do not show any significant atherosclerosis.

The right lung weighs 640 grams and the left lung weighs 540 grams. There is early decomposition change. The lungs are of soggy consistency. The pleural surfaces are smooth and glistening and show moderate anthracotic mottling. The pulmonary artery branches do not show thromboemboli. The tracheobronchial tree is lined by an otherwise intact mucosa. The lungs on sectioning do not show tumor or consolidation.

The liver weighs 1420 grams. The capsule is intact. The external and cut surfaces are brown with no focal lesions. There is diffuse postmortem soft consistency. The gallbladder contains a few milliliters of bile and no gallstones.

The spleen weighs 170 grams. The capsule is intact. There is marked soft consistency due to decomposition change. There are no focal lesions.

The adrenal glands are unremarkable except for soft consistency.

The right kidney weighs 200 grams. The left kidney weighs 200 grams also. The left kidney shows a ½ inch smooth lined clear fluid containing cyst. The capsules are intact. The cortical surfaces are brown. On the cut surfaces, the cortex and medulla are otherwise well demarcated. The renal papillae, calyces and pelvis are otherwise unremarkable. The ureters are of normal caliber and patent. The urinary bladder contains 100 milliliters of urine. The lining mucosa is intact. The prostate gland is unremarkable. Both testes show soft consistency and are otherwise unremarkable on the external and cut surfaces.

The pancreas is of the usual size, shape, and configuration and unremarkable.
The esophagus shows intact mucosa. The muscularis is intact. The stomach contains a few milliliters of mucoid material. The rugal pattern is lost. The mucosa and muscularis are intact. The small and large intestines show early postmortem discoloration and are otherwise unremarkable. The appendix is intact.

Neck: The skin flap is reflected cephalad. The strap muscles do not show any hemorrhage. The thyroid gland is of usual size, shape and configuration. The hyoid bone is intact. The tongue is intact. The larynx and trachea do not show any foreign bodies. The lining mucosa is intact except for postmortem early discoloration. There is no pre-vertebral hemorrhage. There is no fracture or dislocation of the neck.

Head: The scalp is reflected by the usual mastoid to mastoid incision. There is diffuse suffusion of decomposition fluid. There are no contusions. The skull bones are intact. Upon exposure of the sphenoid sinus at the base of the skull, there is a small amount of mucoid fluid. The dura mater is intact. There is no epidural, subdural, or subarachnoid hemorrhage. The brain is symmetrical and of soft consistency and weighs 1520 grams. The cranial nerves and vessels at the base of the brain are intact. The arachnoid is translucent. The cerebellum and brainstem are serially sectioned. There are no focal lesions. The cerebral hemispheres are coronally sectioned. The ventricles are of relative normal size. The basal ganglia do not show any focal lesions. There is no intra-cerebral hemorrhage. There are no contusions.
ADDITIONAL STUDIES OR TESTS

Often additional studies or tests may be later requested to add information to that obtained through the postmortem examination. Specimens that may be needed for future testing are saved for a limited time. These will be discarded twelve months following the date of the postmortem examination. They can, of course, be kept longer if we receive a written request to do.

As a routine part of the postmortem examination photographic images are prepared and retained.
### AEGIS SCIENCES CORPORATION
345 Hill Avenue Nashville, TN 37210
Ph: (615) 255-2460 Fax: (615)255-3030 Web: www.aegislabs.com

<table>
<thead>
<tr>
<th>Client:</th>
<th>1186 - Galveston Co MB Office</th>
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</thead>
<tbody>
<tr>
<td>Report To:</td>
<td>Galveston Co MB Office</td>
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<td>6607 Hwy 1766</td>
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<td></td>
<td>Texas City, TX 77591</td>
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<td>Case ID:</td>
<td>ML 2008-317 Stone, Roger</td>
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<tr>
<td>Laboratory ID:</td>
<td>4380063</td>
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<tr>
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<td>06/12/08 14:15</td>
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<tr>
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<td>06/24/08 08:46</td>
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<td>Reported:</td>
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#### Test(s) Ordered:
- 40610 - MB Targeted Toxicology Profile
- 70311 - Confirmation Amphetamines
- 70251 - Confirmation Volatiles

#### Drug Class
- Alcohol - Volatiles
  - Methanol
  - Ethanol
  - Acetone
  - Isopropanol
- Acetaminophen
- Amphetamines
- Barbiturates
- Benzodiazepines
- Cannabinoids (Marijuana)
- Cocaine Metabolites
- Opiates
- Methadone
- Meperidines
- Propoxyphene
- Fentanyl Analogs
- Meprobamate
- Salicylates
- Tricyclic Antidepressants

#### Result

#### Quantitation

#### Reporting Threshold

---

I certify that the specimen identified by this accession number has been handled and analyzed in accordance with all applicable requirements.

Certified by: PAIGE LONG

Date: 06/24/08

---

Enclosure: OFF  page 7 of 4
Case # 4466 727
ECN 3279482 - 014
Client: 1186 - Galveston Co ME Office
Report To: Galveston Co ME Office
       6607 Hwy 1764
       Texas City, TX 77591
Reason: Post-mortem
Specimen Type: Urine

Case ID: ML 2008-317 Stone, Roger
Laboratory ID: 4380066
Collected: 06/09/08 00:00
Received: 06/12/08 14:15
Completed: 06/12/08 14:16
Reported: 06/24/08 10:55

Test(s) Ordered: 49999 - Sample Received

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<td>Testing not requested or indicated.</td>
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I certify that the specimen identified by this accession number has been handled and analyzed in accordance with all applicable requirements.

Certified by: [Redacted] of Report
Date: JUN 25 2008

PAIGE LONG

Enclosure: [Redacted] page 1 of 7
Case #: [Redacted] 727
ECN: [Redacted] 9-11-2009 4-0-4
Client: 1186 - Galveston Co ME Office
Report To: Dr. [REDACTED]
Galveston Co ME Office
6607 Hwy 1764
Texas City, TX 77591

Reason: Post-morlem
Specimen Type: Vitreous

Case ID: ML 2008-317 Stone, Roger
Laboratory ID: 4380067
Collected: 06/09/08 00:00
Received: 06/12/08 14:15
Completed: 06/23/08 14:00
Reported: 06/24/08 10:55

Test(s) Ordered: 40405 - Alcohol/Volatiles

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I certify that the specimen identified by this accession number has been handled and analyzed in accordance with all applicable requirements.

Certified by [REDACTED]
Date: JUN 25 2008

END OF REPORT
December 15, 2005

[Redacted]
Chief Executive Officer
Texas A&M University at Galveston
Post Office Box 1675
Galveston, Texas 77553-1675

I HAVE SEEN THE ORIGINAL AND
COMPIRED THIS COPY WITH IT, AND
FIND THIS TO BE A TRUE COPY.

[Redacted]
U.S. COAST GUARD
MARINE SAFETY UNIT
GALVESTON, TEXAS

Dear [Redacted]:

I am pleased to donate the new Cynthia Woods Cape Fear 38' Regatta to Texas A&M University at Galveston, and I've enclosed a Gift Deed duly signed and acknowledged by me.

This vessel includes a full set of Quantum racing sails, Quantum practice sails, and an Ocham instrument package. The boat also includes a 29hp Volvo Penta diesel saildrive with two-blade folding prop. The approximate retail value is $360,000.

The title is enclosed with this letter. Please acknowledge receipt of the vessel by signing and returning a copy of the Gift Deed to my attention.

I would like the A&M sail team at the Galveston campus to be the primary user of the Cynthia Woods. I look forward to hearing wonderful news of regattas won using this new racing boat.

Sincerely,

[Redacted]

Enclosures

Enclosures: 4/17 page X of X
Case # 396972
ECN 396972 - 0/5

MAY 30 2006 at 11:45

1850 JPMorgan Chase Tower, 600 Travis, Houston, Texas 77002 713-377-5001

CW 0000389
The undersigned CORPORATION hereby certifies that the vessel described below, the property of the said CORPORATION, has been transferred this 13th Day of December, 2006 from:

Cape Fear Yacht Works
111 Bryan Road
Wilmington, NC 28412

To:

[Redacted]
Suite 1850
800 Travis
Houston, TX 77002

Vessel: CF38200507 52538       UAR380071505

The CORPORATION certifies that this is the first transfer of such vessel in ordinary trade and commerce.

CORPORATION: Cape Fear Yacht Works
111 Bryan Road
Wilmington, NC 28412

MAY 30 2006 AM 11:45

BY: [Redacted], General Manager

Date 1/3 Dec 05

Enclosure: 01/0 page 1 of 8
Case # 400-927
ECN 3039642-01/0
# Fleet: LYC Cruising-Spin (6 boats) (top)

Series Standing - 1 races scored

Information is final.
Regatta results last updated: Saturday, October 07, 2006 4:20:21 PM CDT

## Division: A

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<tr>
<td>1</td>
<td>USA 14</td>
<td>Rented Mule</td>
<td>A</td>
<td>1:16:57:00</td>
<td>1:13:57:00</td>
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<tr>
<td>2</td>
<td>52238</td>
<td>Son of Boomer</td>
<td>B</td>
<td>1:17:12:52</td>
<td>1:15:20:22</td>
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<td>4</td>
<td>A115</td>
<td>Liberty Bella</td>
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## Division: B

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<tr>
<td>1</td>
<td>88</td>
<td>40 Love</td>
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<td>1:19:24:07</td>
<td>1:14:24:07</td>
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<tr>
<td>7</td>
<td>27</td>
<td>Blue Norther</td>
<td>B</td>
<td>1:21:05:13</td>
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<td>Ruthless</td>
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<td>40730</td>
<td>Yaga</td>
<td>C</td>
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<td>3</td>
<td>010</td>
<td>PINGUIN</td>
<td>C</td>
<td>1:21:54:17</td>
<td>1:16:31:47</td>
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<td>179</td>
<td>SUSAN II</td>
<td>C</td>
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<tr>
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<td>65</td>
<td>Mental Floss</td>
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<td>30/DNF</td>
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<tr>
<td>6</td>
<td>55675</td>
<td>Vela</td>
<td>C</td>
<td>45:15:00</td>
<td>2:06:39:30</td>
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<td>43</td>
<td>Pearl-DNC</td>
<td>C</td>
<td>45:15:00</td>
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<td>Melisje</td>
<td>D</td>
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<td>1:14:26:34</td>
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<td>495</td>
<td>Three Sheets to the Wind</td>
<td>D</td>
<td>2:02:58:22</td>
<td>2:20:58:22</td>
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<td>325</td>
<td>First Born</td>
<td>D</td>
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<td>Jessie A.</td>
<td>D</td>
<td>30/DNF</td>
<td>2:04:52:30</td>
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### Dive Report

**Acct:**

**Billed:**

**Inv. #:** 9-1-10

**E-mailled:**

**CC:**

**DIVER:** [Redacted]

**Date:** 2/14/07  **Time:** 1/2hr

### Boat Information:

**Cynthia Woods**  
**Cape Fear 38 ft. S**  
**Pelican Island**

**Texas A & M Galveston Fiscal Dept.**  
**P.O. Box 1675**  
**Galveston Tx 77533**

FEB 16 2007 PM 2:40

---

#### Parts Checked

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<th>Algae Growth</th>
<th>Barnacle Growth</th>
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<td>Poor</td>
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<td>G</td>
<td>F</td>
<td>F</td>
<td>N</td>
</tr>
<tr>
<td>Hull</td>
<td>G</td>
<td>F</td>
<td>F</td>
<td>N</td>
</tr>
<tr>
<td>Keel</td>
<td>G</td>
<td>F</td>
<td>F</td>
<td>N</td>
</tr>
<tr>
<td>Rudder</td>
<td>G</td>
<td>F</td>
<td>F</td>
<td>N</td>
</tr>
<tr>
<td>Manning Gear</td>
<td>G</td>
<td>F</td>
<td>F</td>
<td>N</td>
</tr>
</tbody>
</table>

---

### Zincs

<table>
<thead>
<tr>
<th>Zincs</th>
<th>Size/Type/Number</th>
<th>Condition</th>
<th>Replaced</th>
<th>How Many Needed/Installed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shaft: For/Std</td>
<td>Saildrive (CD)</td>
<td>Good (G)</td>
<td>Y (N)</td>
<td>0</td>
</tr>
<tr>
<td>Prop: For/Std</td>
<td></td>
<td></td>
<td>Y (N)</td>
<td>0</td>
</tr>
<tr>
<td>Strut: For/Std</td>
<td></td>
<td></td>
<td>Y (N)</td>
<td>0</td>
</tr>
<tr>
<td>Rudder: For/Std</td>
<td></td>
<td></td>
<td>Y (N)</td>
<td>0</td>
</tr>
<tr>
<td>Trim Tabs: For/Std</td>
<td></td>
<td></td>
<td>Y (N)</td>
<td>0</td>
</tr>
<tr>
<td>Bow Thruster</td>
<td></td>
<td></td>
<td>Y (N)</td>
<td>0</td>
</tr>
<tr>
<td>Transom/Hull</td>
<td></td>
<td></td>
<td>Y (N)</td>
<td>0</td>
</tr>
</tbody>
</table>

**G=Good  F=Fair  P=Poor  M=Missing**

---

**Notes:** Very bottom of keel stuck in mud.

---

I HAVE SEEN THE ORIGINAL AND COMPARED THIS COPY WITH IT, AND FIND THIS TO BE A TRUE COPY.

**Investigating Officer**  
**U.S. Coast Guard**  
**Marine Safety Unit**  
**Galveston, Texas**

**COPY**

CW 0002033
**Dive Report**

**Acct:**

**Billed:**

**Inv. #:** Le 1499

**E-mailed:**

**CC:**

**DIVER:**

**Date:** 24-08

**Time:** 3hrs

**Boat Information:**

Cynthia Woods
Cape Fear 36 ft. S
Felician Island

Texas A & M Galveston Fiscal Dept.
P.O. Box 1673
Galveston Tx 77553

<table>
<thead>
<tr>
<th>Parts Checked</th>
<th>Paint Condition</th>
<th>Algae Growth</th>
<th>Barnacle Growth</th>
<th>Bilster</th>
<th>Size/Type/Number</th>
<th>Condition</th>
<th>Replaced</th>
<th>How Many</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waterline</td>
<td>G F (P)</td>
<td>N L M (H)</td>
<td>N L M (H)</td>
<td>None</td>
<td>Sail 31' (1)</td>
<td>F-15%</td>
<td>Y N</td>
<td>N I</td>
</tr>
<tr>
<td>Hull</td>
<td>G F (P)</td>
<td>N L M (H)</td>
<td>N L M (H)</td>
<td>Y N</td>
<td>Prop 31' (2)</td>
<td>Y N</td>
<td>Y N</td>
<td>N I</td>
</tr>
<tr>
<td>Keel</td>
<td>G F (P)</td>
<td>N L M (H)</td>
<td>N L M (H)</td>
<td>Y N</td>
<td>Strut 31' (3)</td>
<td>Y N</td>
<td>Y N</td>
<td>N I</td>
</tr>
<tr>
<td>Rudder</td>
<td>G F (P)</td>
<td>N L M (H)</td>
<td>N L M (H)</td>
<td>Y N</td>
<td>Rudder 31' (4)</td>
<td>Y N</td>
<td>Y N</td>
<td>N I</td>
</tr>
<tr>
<td>Running Gear</td>
<td>G F (P)</td>
<td>N L M (H)</td>
<td>N L M (H)</td>
<td>Y N</td>
<td>Trim Tabs 31' (5)</td>
<td>Y N</td>
<td>Y N</td>
<td>N I</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Bow Thruster</td>
<td>Y N</td>
<td>Y N</td>
<td>N I</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Transom/Hull</td>
<td>Y N</td>
<td>Y N</td>
<td>N I</td>
</tr>
</tbody>
</table>

**Zincs**

-Good F=Fair P=Poor M=Missing

**Notes:** Bottom of keel buried in mud.

**Visibility:** 7 ft.

---

I HAVE SEEN THE ORIGINAL AND COMPARRED THIS COPY WITH IT, AND FIND THIS TO BE A TRUE COPY.

INVESTIGATING OFFICER
U.S. COAST GUARD
MARINE SAFETY UNIT
GALVESTON, TEXAS

Enclosure: 2. Page 3 of 2

Case #: 266721
ECN: 32796:0 - 019
**Dive Report**

**Acct:**

**Billed:**

**Inv. #:** L6-499

**DIVER:** Zac

**Date:** 1/24/08

**Time:** 3hr

**Boat Information:**

<table>
<thead>
<tr>
<th>Boat</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cynthia Woods</td>
<td>1</td>
</tr>
<tr>
<td>Capefare 38 ft. S</td>
<td>3</td>
</tr>
<tr>
<td>Pelican Island</td>
<td>1</td>
</tr>
</tbody>
</table>

**Jim Atchley**
Texas A & M Galveston Fiscal Dept.
P.O. Box 1675
Galveston Tx 77553

<table>
<thead>
<tr>
<th>Parts Checked</th>
<th>Paint Condition</th>
<th>Algae Growth</th>
<th>Barnacle Growth</th>
<th>Bilatera Size/Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Good</td>
<td>Fair</td>
<td>Poor</td>
<td>None</td>
</tr>
<tr>
<td>Waterline</td>
<td>G</td>
<td>F</td>
<td>P</td>
<td>N</td>
</tr>
<tr>
<td>Hull</td>
<td>G</td>
<td>F</td>
<td>P</td>
<td>N</td>
</tr>
<tr>
<td>Keel</td>
<td>G</td>
<td>F</td>
<td>P</td>
<td>N</td>
</tr>
<tr>
<td>Rudder</td>
<td>G</td>
<td>F</td>
<td>P</td>
<td>N</td>
</tr>
<tr>
<td>Running Gear</td>
<td>C</td>
<td>F</td>
<td>P</td>
<td>N</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Zincs</th>
<th>Size/Type/Number</th>
<th>Conditions</th>
<th>Replaced</th>
<th>How Many Needed/Installed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shaft: Port Side</td>
<td>Sail Dr 1</td>
<td>F-75%</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Prop: Port Side</td>
<td></td>
<td></td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Strut: Port Side</td>
<td></td>
<td></td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Rudder: Port Side</td>
<td></td>
<td></td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Trim Tabs: Port Side</td>
<td></td>
<td></td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Bow Thruster</td>
<td></td>
<td></td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Transom/Hull</td>
<td></td>
<td></td>
<td>Y</td>
<td>N</td>
</tr>
</tbody>
</table>

**Notes:**

- Check Sail Dr. No Circulation - parts stopped. 2?? Check why???
- Also clean George filter might need to it. (out and Rudder)

*Bottom of keel burried in mud*
Dive Report  Acct:  Billed:  Inv.#:  
E-mailed:  
CC:  
DIVER:  
Date:  
Time:  

Best Information:
Cynthia Woods  
Capoerar 38 ft. 3  
Pelican Island  

Texas A & M Galveston Fiscal Dept.  
P.O. Box 1675  
Galveston, TX 77553  

<table>
<thead>
<tr>
<th>Parts Checked</th>
<th>Paint Condition</th>
<th>Algae Growth</th>
<th>Barnacle Growth</th>
<th>Bilge()s</th>
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</thead>
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<tr>
<td></td>
<td>Good</td>
<td>Fair</td>
<td>Poor</td>
<td>Low</td>
</tr>
<tr>
<td>Waterline</td>
<td>G</td>
<td>F</td>
<td>P</td>
<td>N</td>
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<td>Hull</td>
<td>G</td>
<td>F</td>
<td>P</td>
<td>N</td>
</tr>
<tr>
<td>Keel</td>
<td>G</td>
<td>F</td>
<td>P</td>
<td>N</td>
</tr>
<tr>
<td>Rudder</td>
<td>G</td>
<td>F</td>
<td>P</td>
<td>N</td>
</tr>
<tr>
<td>Running Gear</td>
<td>G</td>
<td>F</td>
<td>P</td>
<td>N</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
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<th>Condition</th>
<th>Replaced</th>
<th>How Many</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Shaft: Forward</td>
<td>SO618464</td>
<td>N</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Prop.: Forward</td>
<td>SO618464</td>
<td>N</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Strut: Forward</td>
<td>SO618464</td>
<td>N</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Rudder: Forward</td>
<td>SO618464</td>
<td>N</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Trim Tab: Forward</td>
<td>SO618464</td>
<td>N</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Bow Thruster</td>
<td>SO618464</td>
<td>N</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Transom/Hull</td>
<td>SO618464</td>
<td>N</td>
<td>Y</td>
<td>N</td>
</tr>
</tbody>
</table>

G=Good  F=Fair  P=Poor  M=Missing

Notes: Vível

Enclosure: 444 page 1 of 4
Case # 444727  
ECN: 333-440-020  

I HAVE SEEN THE ORIGINAL AND COMPAED THIS COPY WITH IT, AND FIND THIS TO BE A TRUE COPY.
# Invoice

**Date:** 6/9/2008  
**Invoice #:** 6-1017

## Bill To

Texas A&M Galveston  
Financial Dept.  
P.O. Box 1675  
Galveston TX 77553

## Terms

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Description</th>
<th>Rate</th>
<th>Amount</th>
</tr>
</thead>
</table>
| 38       | Real Estate Maintenance, per foot  
          | 2.00  | 76.00  |
|          | Galveston Trip  
          | 10.00 | 10.00  |
|          | tax exempt  
          | 0.0016 | 0.00   |

We would like to express our condolences here at Darkwater Drivers for the loss of a friend & crew member. Our deepest sympathies are with you.

Thank you

Paid by credit card. Thank you.

Total: $86.00

---

**Phone #:** 232-284-4166  
**E-mail:** darkwaterdrivers@yahoo.com

Enclosure: 0.00 page 2 of 2  
Case #: 4852787  
UN 3259614-9380

**COPY**

CW 0000806
Offshore Sail Team Meeting 9/2/07

1. Fill out Personal Data Sheets and Sign in Sheets. We practice every Sunday at 1300, you must attend practice if you want to sail the regattas.

2. All students with no sailing experience must take Competitive Offshore Sailing before you can sail any regatta with the Offshore Sail Team.

3. Eligibility-Must be a full time student, 2.0 GPA and swim 50 yards.

4. Safety is # one, all crew must wear PFD's on boats before leaving the Boat Basin. PFD's can be found on each boat.

5. Benefits-Learn keel boat sailing and sailboat racing. If your team wins a trophy your name will be engraved on the trophy and placed in the trophy case in Sea Aggie Center.

6. Care of Boats-The University is furnishing you with good equipment, don't abuse it. Upon returning from practice or a race the main sail should be flaked on the boom and covered, head sails should be folded and bagged except for Reveille and Gipsy north practice sails which should be left on the roller furling foil, spinnakers should be packed in the bag it came out of, pick up all trash and put it in trash bags(bags are on the boat) and put the bags in the dumpster, running lines should be coiled, docking lines should be flemished. Boats should be thoroughly washed down with fresh water.

7. Do not change any settings on the electronics, or remove any equipment or rigging without asking I am always open to suggestions.

8. When you crew on the boat you will be given a job assignment by the coach or student skipper. Only the coach or student skipper can change your job assignment. If you have questions about your job discuss it with the coach on board or .

9. Equipment-You will need deck shoes, sailing gloves and appropriate sailing gear so please do not show up in a thong and flip flops. When we race the University will furnish you caps, skirts and foul weather gear if necessary.

10. Our student skippers this semester are and on Reveille.

11. The Harvest Moon Regatta is Oct 19 thru 22. This is our last regatta of the year 2007. We will have at least two boats in the race from Galveston to Port Aransas, 155nm miles offshore and overnight. Cynthia Woods and Reveille race for Texas A&M. Reveille will sail non-spin and Cynthia Woods will sail

You must attend practice on Sunday afternoon to sail in regattas.
A-sailmaker. Crews will be selected by practice attendance, experience and proven ability.

I have here the original and compared this copy with it, and find this to be a true copy.

[Signature]

[Title]

[Company]

[Location]
TEXAS A&M UNIVERSITY AT GALVESTON

SAILING – COMPET. OFFSHORE

Class 1

1. Check roll-hand out syllb. And go over same.

2. Why offshore sailing?

3. The purpose of this course is to learn something about sailing offshore and having a good time. You will earn 1 hr credit although you must have 1 hr pass/fail in KINE during your first four years here at the University. Some of you may go on to team racing and some may not enjoy sailing at all which is OK, sailing is not for everyone.

4. Hand out Personal Data Sheets

5. Hand out – Sailing Terms and Rigging

6. Hand out – Conduct at the Boat Basin

7. Class sailing-Class sailing on Friday, Team racing on Sunday

   i. HYC-Freeport Triangle
   ii. Veracruz Mexico or South Padre Island
   iii. Texas Ocean Racing Circuit
   iv. Harvest Moon
CYNTHIA WOODS

CHECK LIST

Pre-Departure

1. Vessel Request completed and filed in Boat Basin Office.
2. Waivers completed for all guests and filed in Boat Basin Office.
3. Lifejackets(PFD'S) for everyone onboard.
4. Turn battery master switch to ON and switch to both.
6. If warning lights on engine instrument panel stay on, shut down engine.
7. Turn off shore power on dock, disconnect shore power, leave cord on dock.
8. VHF Radio check, channel 16.
9. Log on board.
10. All hands must wear a PFD before leaving dock.
11. Cast-off, leave lines on dock.

Underway

1. Leave battery master switch on "BOTH" when engine is running, DO NOT turn off master switch while engine is running.
2. Hoist sails in following order, Main then Jib or Spinnaker.
3. Stop engine when under sail, turn OFF ignition key, switch battery master switch to #2 battery for lights, instruments and radio.
4. Switch battery master switch on BOTH for restarting and running engine.

Return and Docking

1. Properly cleat and flemish all mooring lines.
2. Stop engine, turn OFF ignition key.
3. Connect and turn on shorepower.
4. Turn battery master switch to OFF.
5. Flake and tie mainsail to boom, fold and bag headsails and spinnakers.
6. Secure all halyards to turning blocks at base of mast.
7. Replace covers on helm, instruments and mainsail.
8. Remove all garbage from vessel, clean and wipe down inside including head.
9. Washdown exterior decks, hull and standing rigging; wipe down with chamois all bright work, ports and hatch covers.
10. Pump bilge if necessary, ease vang and backstay.
12. Turn in key to Boat Basin Office.

CW 0000626
Cynthia Woods
Veracruz Regatta

June 6 thru June 20, 2008

1. What to bring: Several changes of clothes w/one pair long pants
   Towel and wash cloth
   Blanket and pillow
   Deck shoes and sail gloves

2. Watch- Watch will rotate every four hours, the safety officer on watch will
   make watch assignments.

   Night watch in the cockpit and on deck requires at least two persons at all
   times. In heavy weather all hands on watch must wear sail vests and harness-
   tethered to a jack line. There will be no sleeping on deck or in the cockpit.
   Use the head on board, do not relieve yourself over the side or stern of the
   boat

3. Start- We will meet at the Boat Basin at 0800 Friday June 6 and depart the
   basin at 1030 for the start in front of the Flagship Hotel Pier at 1400. When
   under sail the clutch control should be placed in reverse to fold the props, the
   control may be placed in the neutral position after the props are folded.

4. Electrical Management: Battery #1 Start engine only
   Battery #2 Accessories, instruments and lights
   Batteries should be charged every 12 hours by running the engine for 30
   minutes. There is a solar powered battery charger on board however it takes 12 to
   24 hours to charge the batteries with solar power. In Veracruz the batteries should
   be charged daily with the engine as there is no shore power on the malecon.

5. At night sail with tri-color light, nav lights when under power.

6. Fresh Water Management: The boat carries 40 gallons of potable water on
   board, 20 gallons on each side, and only one tank valve should be open at a
   time as the system is gravity feed and if both tanks are open it will cause an
   overflow. The Water Pump switch on the electrical panel must be on for the
   system to work in the sinks. Drinking water will be in bottles on board and
   should not be wasted under any circumstances.

7. Dress: University shirts, caps and shorts will be worn at the start and at the
   dinner parties in Veracruz.
8. Mexico: Remember that you are guests in Mexico and you are in a foreign country where few speak English. If you go out at night go in a group, **DO NOT GO OUT ALONE** to bars or clubs in Mexico.

9. We will depart Veracruz on Sunday June 15 with stops at Isla Lobos and Tuxpan if so desired. Then Port Isabel to clear US Customs or direct to Galveston to clear US Customs. The Cynthia Woods should arrive in Galveston on June 19 or June 20.

10. **ALCOHOL, ILLEGAL DRUGS AND TOBACCO ARE NOT ALLOWED ON BOARD UNIVERSITY VESSELS.**
CYNTHIA WOODS Inventory


All items removed from the vessel were taken to Texas A & M University at Galveston Nautical Archaeologist at Pelican Island BLDG 3026, Room 402. All items were logged as they were removed from the vessel and inventoried at Texas A & M.

[Redacted] Underwriter's Representative, Robert Hanson, Texas A & M Representative, [Redacted] T & T Marine Salvage, and [Redacted] Nautical Archaeologist, were in attendance.

All items and bags were properly inventoried, photographed, and any items removed from the bags were returned unless otherwise noted. Items not returned were determined to be a safety hazard or waterlogged paper in most cases.

I have seen the original and compared this copy with it, and find this to be a true copy.

[Redacted]
INVESTIGATING OFFICER
U.S. COAST GUARD
MARINE SAFETY UNIT
GALVESTON, TEXAS
ITEM #1: Black and Gray Zippered Bag - Removed from the vessel by salvage divers on 06/10/2008

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DISPOSITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>35mm Camera in Waterproof Case</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Charger</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>35mm Film - 4 canisters</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Student Information Systems Book</td>
<td>Disposed</td>
</tr>
<tr>
<td>Zip Lock Bag</td>
<td></td>
</tr>
<tr>
<td>Passport Wallet</td>
<td>Returned to Bag</td>
</tr>
<tr>
<td>University ID Card</td>
<td>Returned to Bag</td>
</tr>
<tr>
<td>Military ID Card</td>
<td>Returned to Bag</td>
</tr>
<tr>
<td>Driver’s License</td>
<td>Returned to Bag</td>
</tr>
<tr>
<td>American Express Traveler’s Checks (2 - $20.00)</td>
<td>Returned to Bag</td>
</tr>
<tr>
<td>Cash - $65,000 USD</td>
<td>Returned to Bag</td>
</tr>
<tr>
<td>Several Blank Personal Checks</td>
<td>Returned to Bag</td>
</tr>
<tr>
<td>Cash - $4,000,000 USD</td>
<td>Returned to Bag</td>
</tr>
<tr>
<td>Check Stub and Register for $4,000,000 USD</td>
<td>Disposed</td>
</tr>
<tr>
<td>Regatta Sailing Rules</td>
<td>Disposed</td>
</tr>
<tr>
<td>TREO Cellular Phone</td>
<td>Returned to Bag</td>
</tr>
<tr>
<td>Reading Glasses</td>
<td>Returned to Bag</td>
</tr>
<tr>
<td>Various Magazines</td>
<td>Disposed</td>
</tr>
</tbody>
</table>

NOTE: ADDITIONAL ITEMS FOUND IN WALLET BY [reddacted] WHILE PRESERVING CONTENTS AND CLEANING. INVENTORY ON SEPARATE LISTING.

I HAVE SEEN THE ORIGINAL AND COMPARED THIS COPY WITH IT, AND FIND THIS TO BE A TRUE COPY.

INVESTIGATING OFFICER
U.S. COAST GUARD
MARINE SAFETY UNIT
GALVESTON, TEXAS

CYNTHIA WOODS Inventory

Page 2
ITEM #2: Black Duffle type Bag with Mesh Top (Pinnacle) - [Redacted]

Removed from the vessel by salvage divers on 06/10/2008

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DISPOSITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sperry Top-sider Shoes size 12M</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Foul Weather Jacket - Henry Lloyd</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Parachute Travel Hammock</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Black Fleece Pullover</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Maroon Swim Trunks</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Foul Weather Bibs (Gills)</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Wet Suit boots</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Disposable Camera</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Texas A &amp; M Offshore Sall team Ball Cap</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>CYNTHIA WOODS Sailing Team Tee-Shirts</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>CYNTHIA WOODS Sailing Team Polo</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Zip Lock bag with Toiletries</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Khaki Bag</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Passport - [Redacted]</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Driver's License - [Redacted]</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>VISA Credit Card</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Health Insurance Card</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Cash - $100.00 USD</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Texas Temporary Driver's License (CDL)</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>White Plastic Bag with Reading Materials</td>
<td>Disposed</td>
</tr>
<tr>
<td>Sunglasses with case</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Sailing gloves</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Water-proof bag inside Duffel</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>First aid Supplies</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>SAMSUNG Verizon Cellular Phone</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Clothes</td>
<td>Returned to bag</td>
</tr>
</tbody>
</table>

Enclosure: [Redacted]  page 3 of 22
Case #: [Redacted]  ECN: [Redacted]

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[Signature]

INVESTIGATING OFFICER
U.S. COAST GUARD
MARINE SAFETY UNIT
GALVESTON, TEXAS
ITEM #3: Red and White West Marine Duffel Bag – Roger Stone

Removed from the vessel by salvage divers on 06/10/2008

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DISPOSITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Various Clothing</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>iPod Adapter for Car</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Sperry Top-Sider Shoes</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Zip Lock Bag</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Wallet</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Driver’s License – Roger Winslow Stone</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Family Portrait</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Bank of America VISA Debit Card</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>AT&amp;T MasterCard</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>JP Morgan MasterCard</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Cash - $314.00USD</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>JP Morgan MasterCard</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>UTMB Business Cards</td>
<td>Waterlogged (Mr. Stone’s) Disposed</td>
</tr>
<tr>
<td>American Express Card (in envelope)</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Tax ID Number</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Various Membership Cards (8)</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Black Diamond Headlamp</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Key Ring with Remote Car Controller</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>OMEGA Wrist Watch (stopped at twenty minutes to 1100 with date 7)</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Tennis Shoes</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Motorola Charger for Cellular Phone</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Disposable Cameras sealed in original foil packaging</td>
<td>Water in foil packaging – disposed of</td>
</tr>
<tr>
<td>iPod</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Plastic pint Flask containing Bourbon</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Misc Clothing and Underclothing</td>
<td>Returned to bag</td>
</tr>
</tbody>
</table>

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U.S. COAST GUARD
MARINE SAFETY UNIT
GALVESTON, TEXAS
ITEM #4: CGI Black Duffel Bag – No Identification

Removed from the vessel by salvage divers on 06/10/2008

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DISPOSITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black Leather Memo Pad with pen</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Reading Glasses (2)</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Key Ring Flashlight</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Sunglasses with case</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Lens for Flashlight</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Ball Cap (2) one with Bubbas BBQ in College Station</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Black Woven Belt</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Misc. Clothing</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>XL Tee Shirt – 2003 Skipper Offshore Sailing Team</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Varsity Sailing Team</td>
<td></td>
</tr>
<tr>
<td>Shirt indicating had been on team from 2004 – 2008</td>
<td></td>
</tr>
<tr>
<td>Galveston Small Boats</td>
<td></td>
</tr>
<tr>
<td>Small Boats Polo Shirt</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Size 38 Underwear</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Flame Doo Rag</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Sunscreen</td>
<td>Returned to bag</td>
</tr>
</tbody>
</table>

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[Signature]

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Enclosure: 24 pages 5 of 22
Case # 466722
ECN 323 9.99 - 244
ITEM #5: GARMIN Model GPSmap 492 - TAMUG

Removed from the vessel by salvage divers on 06/10/2008

| Serial Number | 70405105 |

ITEM #6: FURUNO marine Radar Model 1623 - TAMUG

Removed from the vessel by salvage divers on 06/10/2008

| Serial Number | 4322-2301 |

ITEM #7: GARMIN 3006C GPSmap - TAMUG

Removed from the vessel by salvage divers on 06/10/2008

| Serial Number | 57502484 |

As per expert cases of items #5-#7 were cracked and to be left standing. After two to three
days compressed air to be utilized to remove any salt in order to attempt to preserve. All
were left in Room 402 (secured)
ITEM #8: Black Leather DELL Computer Bag – Roger Stone

Removed from the vessel by salvage divers on 06/11/2008

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DISPOSITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Book</td>
<td>Disposed – Waterlogged</td>
</tr>
<tr>
<td>Yellow Mini Legal Pad with checklist</td>
<td>Preserved **see additional notes for writings in pad</td>
</tr>
<tr>
<td>Sailing Rules</td>
<td>Disposed</td>
</tr>
<tr>
<td>Bill from [redacted]</td>
<td>Disposed</td>
</tr>
<tr>
<td>DELL Laptop Computer</td>
<td></td>
</tr>
<tr>
<td>Property of ATOS ORIGIN G33478</td>
<td></td>
</tr>
<tr>
<td>Serial Number CN-OC4708-48643-592-4313</td>
<td></td>
</tr>
<tr>
<td>Service Tag J8YSR81</td>
<td></td>
</tr>
<tr>
<td>Express Service Code 41901042385</td>
<td></td>
</tr>
<tr>
<td>Handheld GARMIN ETREX GPS</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Batteries</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Sunglasses</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>GARMIN window mounting device</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Orchestra Ticket “World of Dance” May 25, at Grand Opera House</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Misc Laptop Accessories (chargers, converters, etc)</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Royal Caribbean International Cruise Vacation Guide</td>
<td>Promotional Literature waterlogged and disposed</td>
</tr>
</tbody>
</table>

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Enclosure: 024 page 7 of 22
Case #: 4100 72-7
CYNTHIA WOODS Inventory
ITEM #94  Blue Duffel Bag (syncsort www.syncsort.com) - No Identification

Removed from the vessel by salvage divers on 06/11/2008

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DISPOSITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ball Cap - Offshore Sailing Team</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Zip-Lock Bag with Toiletries</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Large Sailing Team Polo Shirt</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>A &amp; M GYPSY NORTH Tee-Shirt</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Tank Top</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Tee-Shirts</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Regatta XXD Polo Shirt</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>XL Swim Trunks</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Khaki Long Pants</td>
<td>Returned to bag</td>
</tr>
</tbody>
</table>

Enclosure: 24  page 5  ol 23
Case # 410727
ECN 32596024

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GALVESTON, TEXAS
ITEM #10: Yellow Pelican Case – GMPCS Personal Communications Satellite Phone

Removed from the vessel by salvage divers on 06/11/2008

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DISPOSITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iridium 9505A</td>
<td>Returned to</td>
</tr>
<tr>
<td>User’s Guide</td>
<td>Returned to</td>
</tr>
</tbody>
</table>

Enclosure: 147 of 22
Case # 404227
ECN 32596 P2 - 224

I have seen the original and compared this copy with it, and find this to be a true copy.

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MARINE SAFETY UNIT
GALVESTON, TEXAS

CYNTHIA WOODS Inventory
ITEM #11: Green and Tan Duffle Bag with Patches – No Identification

National Adjudicators Invitational Patch

Removed from the vessel by salvage divers on 06/11/2008

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DISPOSITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shaving Kit – Maroon</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Misc. Clothes</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Ball Cap</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Socks</td>
<td>Returned to bag</td>
</tr>
</tbody>
</table>

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[Handwritten signature]

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MARINE SAFETY UNIT
GALVESTON, TEXAS

Enclosure: page 10 of 12
Case # 1004/22
ECN 223969.24- Q24
ITEM #1: Duffel Bag made of Pentax Mylar – No Identification

Removed from the vessel by salvage divers on 06/11/2008

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DISPOSITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hex Wrench</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Foulies (bib and uppers) West Marine</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Foulie Boots</td>
<td>Returned to bag</td>
</tr>
</tbody>
</table>

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MARINE SAFETY UNIT
GALVESTON, TEXAS

CYNTHERIA WOODS Inventory
ITEM #13: Trans Black and Gray Nap sack – [Redacted]

Removed from the vessel by salvage divers on 06/11/2008

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DISPOSITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flip Flops</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Snacks</td>
<td>Disposed</td>
</tr>
<tr>
<td>Contact Case</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Light Foul Weather Gear – Navy Blue</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Passport – Joseph Savana</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Wallet</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Driver's License Joseph Savana</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>PetsMart Gift Card</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Starbucks Gift Card</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Video Shack Gift Card</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>West Marine Member Card</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Texas A &amp; M ID</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>CPR Certification</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Coffee Card</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Picture of Female</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Insurance Card – State Farm</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Bank of America VISA Credit Card</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Hunting License</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Old Navy Gift Card</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Sonic Card</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Cash - $7.00 USD</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Pizza Hut Gift Card</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Various General Membership Cards</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Starbucks Gift Card</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Red Lobster Gift Card</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>James Coney Island Gift Card</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Resident All Water Fishing License</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Sunscreen</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Water-proof Disposable Camera</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Nintendo DS</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Armadillo Stuffed Animal</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Sunglasses</td>
<td>Returned to bag</td>
</tr>
</tbody>
</table>
ITEM #14: Hunter Green JanSport Nap sack - Roger Stone

Removed from the vessel by salvage divers on 06/11/2008

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DISPOSITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passport Billfold and Passport - Roger Stone</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Plastic Bag with Meds</td>
<td></td>
</tr>
<tr>
<td>ATENOLOL w/CHLORTHALID Tabs</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>RPh: [redacted]</td>
<td></td>
</tr>
<tr>
<td><a href="http://www.medco.com">www.medco.com</a></td>
<td></td>
</tr>
<tr>
<td>800-473-3455</td>
<td></td>
</tr>
<tr>
<td>BENICAR Tabs</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>RPh: [redacted]</td>
<td></td>
</tr>
<tr>
<td><a href="http://www.medco.com">www.medco.com</a></td>
<td></td>
</tr>
<tr>
<td>800-473-3455</td>
<td></td>
</tr>
<tr>
<td>Over the Counter Pain Reliever - Walgreens</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Over the Counter Pain Reliever PM - Walgreens</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Zantac</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Ball Cap (3)</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Three Crockles</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Mesh Bag</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Personal Locator Light - functional</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Web Strapping</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>ACE Ankle Brace</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>SONY Earphones In Zip Lock Bag</td>
<td>Returned to bag</td>
</tr>
</tbody>
</table>

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GALVESTON, TEXAS

Enclosure: [Page 11 of 22]
Case # 906 747
ECN 323962A - 007

CYNTHIA WOODS Inventory
ITEM #15: Army green/Light Green Sleeping Bag in Gray Bag – No Identification
Removed from the vessel by salvage divers on 06/11/2008

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GALVESTON, TEXAS

Enclosure: 424 page 14 of 22
Case #: 424727
ECN 3039402 - Q24
ITEM #16: Loose items Removed from Vessel (after de-watered and placed on dock)

Removed from the vessel by Thor Jones and Kelly Teichman on 06/11/2008

<table>
<thead>
<tr>
<th>ITEM</th>
<th>DISPOSITION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sperry Top-Sider Sandals</td>
<td>Room 402</td>
</tr>
<tr>
<td>Thermos</td>
<td>Room 402</td>
</tr>
<tr>
<td>Right Tennis Shoe</td>
<td>Room 402</td>
</tr>
<tr>
<td>Motorola Cellular Phone</td>
<td>Room 402</td>
</tr>
<tr>
<td>Green and Black Foulie Bibs</td>
<td>Room 402</td>
</tr>
</tbody>
</table>

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GALVESTON, TEXAS

Enclosure: 024, page 1 of 22
Case #: 444-72
ECN 323-968-2 - 024
ITEM #17: ACR Model RLB-35 CAT I (EBIRB) - TAMUG

Removed from the vessel by salvage divers on 06/11/2008

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serial Number</td>
<td>4998</td>
</tr>
<tr>
<td>Battery Replacement Date</td>
<td>04/20/2011</td>
</tr>
<tr>
<td>Test Function</td>
<td>Functioning</td>
</tr>
<tr>
<td>Hammar Model H2O Hydrostatic Release</td>
<td>Expiration Date is not properly punched</td>
</tr>
<tr>
<td></td>
<td>Highest year is 2008</td>
</tr>
<tr>
<td>NOAA Registration</td>
<td>Expiration Date May 5, 2008</td>
</tr>
</tbody>
</table>

Remains in Room 402 - secured

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GALVESTON, TEXAS

ENCLOSURE: 024, page 14 of 23
Case #: 146-747
ECN: 3219-027-029
ITEM #20: Survival Vest - No Identification

Removed from the vessel by Thor Jones and Kelly Telchman on 06/11/2008 after vessel dewatered and lifted on dock

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Disposition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow CO2 Inflatable with Strobe Attached light in the flashlight position; battery dead.</td>
<td>Room 402 - Secured</td>
</tr>
</tbody>
</table>

CO2 Cartridge is expended
ITEM #21: Blue Expandable File - TAMUG

Removed from the vessel by salvage divers on 06/11/2008

File contains what appears to be operational manuals and is marked "CAPE FEAR 38" - VAR380071505

File contains thirteen compartments and all have documents with the exception of the compartment marked "ELECTRICAL".

File remains immersed in sea water and is in Room 402 - secured.
**ITEM #22:** Igloo Coolers – 30 quart - TAMUG

Removed from the vessel by Thor Jones and Kelly Teichman on 06/11/2008 after vessel dewatered and lifted on dock

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Disposition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Marked “Small Boat Basin”</td>
<td>Room 402 - Secured</td>
</tr>
<tr>
<td>1 Marked CYNTHIA WOODS</td>
<td>Room 402 – secured</td>
</tr>
</tbody>
</table>

**ITEM #23:** WEST MARINE PFD - TAMUG

Removed from the vessel by Thor Jones and Kelly Teichman on 06/11/2008 after vessel dewatered and lifted on dock

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Disposition</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 – Yellow TYPE III</td>
<td>Room 402 - Secured</td>
</tr>
</tbody>
</table>

**ITEM #24:** Misc. Items Removed to Lighten the CYNTHIA WOODS for Lift - TAMUG

Removed from the vessel by salvage divers on 06/11/2008

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Disposition</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 Gray Seat Cushions</td>
<td>Room 402 - Secured</td>
</tr>
<tr>
<td>Maroon and White Main Sail Cover</td>
<td>Room 402 – Secured</td>
</tr>
<tr>
<td>Maroon Sail Wheel and Pinnacle Cover</td>
<td>Room 402 – Secured</td>
</tr>
<tr>
<td>Folding Danforth Anchor, chain and rope</td>
<td>Room 402 - Secured</td>
</tr>
</tbody>
</table>

I HAVE SEEN THE ORIGINAL AND COMPARED THIS COPY WITH IT, AND FIND THIS TO BE A TRUE COPY.

[Signature]

INVESTIGATING OFFICER
U.S. COAST GUARD
MARINE SAFETY UNIT
GALVESTON, TEXAS
ITEM #1: Additional items found in Wallet - [redacted]

Removed from wallet by [redacted] while attempting to preserve and clean contents. Verified by [redacted]

<table>
<thead>
<tr>
<th>ITEM</th>
<th>Disposition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash $170.00 USD</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>US quarter (Rhode Island with Sailboat)</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Additional Blank Checks</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Gold Wedding Band 6/5/75 MTR to SMC</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Citi MasterCard</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>TAMUG State of Texas Travel Card MasterCard</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>HomeTown Bank MasterCard</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Official Emergency Response ID Card Galveston</td>
<td>Returned to Bag</td>
</tr>
<tr>
<td>Discover Card</td>
<td>Returned to Bag</td>
</tr>
<tr>
<td>Various Club Cards (including Library Card)</td>
<td>Returned to bag</td>
</tr>
<tr>
<td>Bank of Galveston Deposit Slip</td>
<td>Returned to bag</td>
</tr>
</tbody>
</table>

I have seen the original and compared this copy with it, and find this to be a true copy.

[Signature]

INVESTIGATING OFFICER
U.S. COAST GUARD
MARINE SAFETY UNIT
GALVESTON, TEXAS

Enclosure: Page 20 of 20

CYNTHIA WOODS Inventory
ITEM #8: Hand Written Notes found on Mini Yellow Legal Pad

PAGE 1

Jack lines [ckd]
Tools? [ckd]
Duct tape [ckd]
Depth [ckd]
Rig man over flag? [ckd]
Docking lines [ckd]
Flags [ckd]
Calculator, compass, headlights, foulies, harness, teather, sleeping bag, pillow, ear plugs
Q-beam [ckd]
compass light
running lights
spreader lights

Page 2

coffee and thermos and mug
steve, fuel, matches
duct tape
sea sick meds
pudding and plastic spoons
nav gear inverter etc.

I HAVE SEEN THE ORIGINAL AND COMPARED THIS COPY WITH IT, AND FIND THIS TO BE A TRUE COPY.

INVESTIGATING OFFICER
U.S. COAST GUARD
MARINE SAFETY UNIT
GALVESTON, TEXAS
HM return waypoints
AA batteries
AAA batteries
2 gallon zip locks

Page 3

Stow gear
Stow food
Put on ice
Life sling
Mizzen reef point

Rest of pages are blank.
# T & T Marine Salvage, Inc.

**Daily Job Log**

**Day One**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>06/08/08</td>
<td><strong>Weekend Premium</strong></td>
</tr>
<tr>
<td>06/09/08</td>
<td><strong>Vessel</strong></td>
</tr>
<tr>
<td>06/09/08</td>
<td><strong>Customer</strong></td>
</tr>
<tr>
<td>06/09/08</td>
<td><strong>Customer Representative</strong></td>
</tr>
<tr>
<td>06/09/08</td>
<td><strong>Location Area Block No.</strong></td>
</tr>
</tbody>
</table>

**OFFSHORE FREIGHT**

**Working as Directed for Search of Sunken Vessel**

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>07:00</td>
<td>Supervisor coordinates logistics with 3rd party surveyors prior to 3rd party divers &amp; deep-sea package as directed by client &amp; T&amp;T command</td>
</tr>
<tr>
<td>07:30</td>
<td>Supervisor arrives at T&amp;T Marine Salvage to mobilize <strong>Vessel's desired weight</strong></td>
</tr>
<tr>
<td>08:30</td>
<td>Arrive at T&amp;T Offshore, begin transferring gear to mobilize <strong>Vessel's desired weight</strong></td>
</tr>
<tr>
<td>08:45</td>
<td>3rd party surveyors &amp; sonar arrive to assist in transferring gear</td>
</tr>
<tr>
<td>09:45</td>
<td>3rd party divers &amp; deep-sea diving equipment arrive to assist in transferring gear</td>
</tr>
<tr>
<td>10:00</td>
<td>Begin conducting search with client &amp; 3rd party teams</td>
</tr>
<tr>
<td>10:45</td>
<td>MV <strong>Echo 1</strong> underway to search area coordinates 28°55.48'N 95°14.24'W</td>
</tr>
<tr>
<td>12:20</td>
<td>Begin receiving calls with new coordinates of semi-submerged wreck 28°31.4N 095°02.3W</td>
</tr>
<tr>
<td>14:20</td>
<td>Arrive on location, dive team setting up pre dive safety meeting &amp; briefing conducted</td>
</tr>
<tr>
<td>14:30</td>
<td>Dive #1 L/S to survey wreck &amp; SV <strong>Gythwaits</strong> nearby shipwrecks</td>
</tr>
<tr>
<td>14:50</td>
<td>keel is missing, most appears to be broken in 3 pieces, hole in hull</td>
</tr>
<tr>
<td>15:10</td>
<td>1 person located in cabin (no sign of life)</td>
</tr>
<tr>
<td>15:20</td>
<td>Diver #1 R/S with person rescued</td>
</tr>
<tr>
<td>15:30</td>
<td>Person secured on deck</td>
</tr>
<tr>
<td>16:00</td>
<td>Decision made by client &amp; team to conduct 2nd dive to deploy 3 ves anchor to secure vessel</td>
</tr>
<tr>
<td>16:10</td>
<td>Diver #1 L/S to locate &amp; deploy anchor</td>
</tr>
<tr>
<td>16:15</td>
<td>Diver #1 R/S on anchor to deploy</td>
</tr>
<tr>
<td>16:20</td>
<td>Several attempts made to prevent vessel from becoming a hazard to navigation</td>
</tr>
<tr>
<td>16:30</td>
<td>Diver #1 L/S to locate &amp; deploy anchor</td>
</tr>
<tr>
<td>16:45</td>
<td>Diver #1 R/S on anchor to deploy</td>
</tr>
<tr>
<td>17:20</td>
<td>T&amp;T command notified of final coordinates</td>
</tr>
<tr>
<td>17:25</td>
<td>MV <strong>Echo 1</strong> underway to search area</td>
</tr>
<tr>
<td>17:55</td>
<td>Arrive at Galveston, Offshore Freighter, 211E stand by for transport of recovered person</td>
</tr>
<tr>
<td>18:00</td>
<td>Demobilize boat, move 290° to keep away from wreck</td>
</tr>
</tbody>
</table>

---

*Note: The document contains additional handwritten notes and corrections.*
<table>
<thead>
<tr>
<th>TIME</th>
<th>LOG DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>0230</td>
<td>Dive team mobilizing</td>
</tr>
<tr>
<td>0328</td>
<td>Arrive at T&amp;T offshore transfer equipment to MV Erin T</td>
</tr>
<tr>
<td>0329</td>
<td>Receive briefing from T&amp;T command</td>
</tr>
<tr>
<td>0400</td>
<td>Under way to search area</td>
</tr>
<tr>
<td>0700</td>
<td>Wreck sighted 28°30.429'N 94°55.222'W at 0800</td>
</tr>
<tr>
<td>0910</td>
<td>Wreck secured to start stern of Erin T with 50' of hawser</td>
</tr>
<tr>
<td>0915</td>
<td>Setting up dive station</td>
</tr>
<tr>
<td>0940</td>
<td>All systems checked - Conducting pre-dive safety meeting &amp; briefing</td>
</tr>
<tr>
<td>0925</td>
<td>Direct P1/2 to establish dropline survey wheat</td>
</tr>
<tr>
<td>0930</td>
<td>Dropline secured - 2 GPS &amp; 1 Radar screen located, mast broken at cabin</td>
</tr>
<tr>
<td>0935</td>
<td>Diver secures hatch to U-Berth</td>
</tr>
<tr>
<td>0940</td>
<td>Diver places life raft into U-Berth to add flotation to keep for towing</td>
</tr>
<tr>
<td>0945</td>
<td>Life raft secured in U-Berth</td>
</tr>
<tr>
<td>0950</td>
<td>Diver collecting 2 GPS &amp; 1 Radar screen as instructed by USCG, rep. on board</td>
</tr>
<tr>
<td>0959</td>
<td>Furuno Radar 162A, Garmin GPS 388EC &amp; Garmin GPS 492 retrieved on deck &amp; in USCG possession</td>
</tr>
<tr>
<td>1000</td>
<td>Diver locates 2 duffle bags inside cabin - Begging for retrieval at USCG request</td>
</tr>
<tr>
<td>1037</td>
<td>2 duffle bags on deck &amp; in USCG possession</td>
</tr>
<tr>
<td>1015</td>
<td>Diver deploys life raft in U-Berth</td>
</tr>
<tr>
<td>1017</td>
<td>Diver rigging 2 more bags located in cabin for retrieval</td>
</tr>
<tr>
<td>1020</td>
<td>Bags (2) on deck &amp; in USCG possession</td>
</tr>
<tr>
<td>1025</td>
<td>Lift Bag #1 sent to diver on dropline</td>
</tr>
<tr>
<td>1030</td>
<td>Lift Bag #1 Secured to mast in cabin</td>
</tr>
<tr>
<td>1031</td>
<td>Lift Bag #1 Inflated</td>
</tr>
<tr>
<td>1035</td>
<td>LB #2 Away</td>
</tr>
<tr>
<td>1040</td>
<td>LB #2 Secured</td>
</tr>
<tr>
<td>1041</td>
<td>LB #2 Inflated</td>
</tr>
<tr>
<td>1045</td>
<td>Diver #1 R/5</td>
</tr>
<tr>
<td>TIME</td>
<td>LOG DATA</td>
</tr>
<tr>
<td>------</td>
<td>----------</td>
</tr>
<tr>
<td>1040</td>
<td>Diver #2 R/S Dressing in. Debrief Dive #1</td>
</tr>
<tr>
<td>1100</td>
<td>Conduct pre-dive briefing &amp; all pre-dive checks.  Condition all moor &amp; surrounding rigging on towing vessel unobjectionable with equipment on board.  Dive #2 scope of work: 1) cut stays (from mast.  2) Clear all lines stowing area from deck that could interfere with safe towing operation.  3) Establish tow bridle to bow cleats - 4) Attach tow lines to bridle.</td>
</tr>
<tr>
<td>1135</td>
<td>Dive #2 L/S to survey and make decision on which stays (wires) to cut (1st)</td>
</tr>
<tr>
<td>1150</td>
<td>Port outboard stay rod unsecured &amp; free.</td>
</tr>
<tr>
<td>1155</td>
<td>Port inboard stay rod unsecured &amp; free. Moving to bow stay (free stay)</td>
</tr>
<tr>
<td>1200</td>
<td>Diver reports: Free stay secured (approx. 6') above railing spoon. No handrails. Raw cleats in good condition with 11&quot; straps running aft to port &amp; starboard cleats.</td>
</tr>
<tr>
<td>1210</td>
<td>Diver moving to inboard stay rods</td>
</tr>
<tr>
<td>1233</td>
<td>Stack inboard stay rod set free.</td>
</tr>
<tr>
<td>1235</td>
<td>Stack outboard stay rod set free.</td>
</tr>
<tr>
<td>1238</td>
<td>Diver cutting mooring line from transom to aft stay wire. Coordinates 29°33’05.5” N 94°32’29.0”W 102’ water depth.</td>
</tr>
<tr>
<td>1241</td>
<td>Mast away</td>
</tr>
<tr>
<td>1245</td>
<td>Diver cleaning all rope &amp; rigging that may interfere with safe towing operation.</td>
</tr>
<tr>
<td>1307</td>
<td>Fill lines cleaned from deck sending tow straps to diver.</td>
</tr>
<tr>
<td>1320</td>
<td>Tow straps to Port &amp; Starboard Bow cleats secured.</td>
</tr>
<tr>
<td>1335</td>
<td>Tow straps secured to bow tow straps.</td>
</tr>
<tr>
<td>1338</td>
<td>Downline removed from wreck.</td>
</tr>
<tr>
<td>1340</td>
<td>Diver #2 R/S</td>
</tr>
<tr>
<td>1344</td>
<td>Make ready for tow - tail buoy on 76' of rope, attached to secondary tow line to shaft start.</td>
</tr>
<tr>
<td>1345</td>
<td>Cox &amp; SV in tow underway to Freeport.</td>
</tr>
<tr>
<td>TIME</td>
<td>LOG DATA</td>
</tr>
<tr>
<td>------</td>
<td>----------</td>
</tr>
<tr>
<td>1341</td>
<td>Dive team rotating on wreck watch while under tow</td>
</tr>
<tr>
<td>2235</td>
<td>Arrive at SB Freepor, change towing arrangement to Port Hip</td>
</tr>
<tr>
<td>2315</td>
<td>Wreck secured on Port Hip</td>
</tr>
<tr>
<td>0045</td>
<td>Arrive at Freepor</td>
</tr>
<tr>
<td>0800</td>
<td>All secured at Freepor</td>
</tr>
<tr>
<td>1000</td>
<td>Dive Supervision</td>
</tr>
<tr>
<td>1400</td>
<td>Working &amp; Diving as directed</td>
</tr>
</tbody>
</table>
Day Three

0615 Arrive at Freeport launch with wreck of SV Cynthia woods secured to Port Hip of Erin T as directed.
0620 All secure.
0630 Meeting w/ Doc Jones (USCG) stored \\
Slaven Glass,,
0640 All secure, dive team down for rest.
0730 Due team up - begin day.
0730 Stand by working as directed. Daily Safety
Brief DiveChaps complete.
0230 Salvage master Tom Flower arrives brief
Dive team on scope of work.
0800 Move barge from hip of Erin to bulk
head.
0810 Release Erin T
0820 Make ready for first dive.
0830 The dive Chapman, complete briefing with
Salvage master.
0845 Diver #1 Dressing in.
0850 Diver #1 Lays to establish messenger
lines.
0903 AFT Slings Established.
0957 Bow Slings set. Diver chlorine wires
with bolt cutters.
0906 Wreck Put A Diver Quiz.
0910 Position salvage Bar and Slings over
wreck.
0935 Check Slings.
0940 Diver #1 RIS Check comes.
1040 Diver is secure line to for and
AFT stages.
1040 Diver Check Slings.
1050 Diver estabish bow area.
1100 All Slings good.
1040 Diver RIS Stand By for Rm.
1040 Knit Complete, Slings secured to chutes.
Begin Lift.
1050 Set up pump for remaining water in
hull. Secure Dive Station.
<table>
<thead>
<tr>
<th>DATE</th>
<th>JOB NUMBER</th>
<th>VESSEL</th>
<th>CUSTOMER</th>
<th>JOB DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-11-08</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TIME</th>
<th>LOG DATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>0750</td>
<td>Removing Articic from Cabin and Vyster as directed.</td>
</tr>
<tr>
<td>0800</td>
<td>Sailing vessel on Site on dock.</td>
</tr>
<tr>
<td>1215</td>
<td>Dive team released from T on way to T &amp; T offshore.</td>
</tr>
<tr>
<td>1530</td>
<td>Arrive at T &amp; T offshore. All Trun gear.</td>
</tr>
<tr>
<td></td>
<td>Arrive at T &amp; T Marine Salvage.</td>
</tr>
</tbody>
</table>
Notes from the interview with [Redacted] on June 13, 2008, taken by CDR James E. Elliott

On June 13, 2008, I observed a portion of an interview by Lcdr [Redacted] BMC [Redacted] and Mr. [Redacted] with [Redacted] an employee of Texas A&M University, regarding the S/V Cynthia Woods marine casualty.

[Redacted] oversees all small boat operations and boat maintenance at the Galveston Campus of Texas A&M University.

[Redacted] stated that he does not have extensive experience with fiberglass repair. Additionally, he stated he does not maintain records with the exception of the log that was maintained onboard the S/V Cynthia Woods. Note: The log book was not recovered from the capsized sailing vessel and has yet to be located.

[Redacted] stated the following personnel routinely perform maintenance on the sailing vessels:

- [Redacted]
- [Redacted]
- [Redacted]
- Roger Stone
- Students employed on a part-time basis

[Redacted] stated he is the final authority for all repairs. Though he did not keep records, he stated the “accounting department” would have all records of haul outs.

Regarding the history of the Cynthia Woods, [Redacted] stated the boat was delivered in November of 2005 in three pieces: (1) hull, (2) keel and (3) mast/spars. Payoo assembled the boat. [Redacted] could not recall exact dates, even approximate months/years; however, he stated the boat had run aground on an oyster reef and, post grounding, there was water intrusion around the aft backing plate. It was subsequently repaired/inspected by Payoo and then went on to complete races.

[Redacted] stated: “I ran it aground on the jetty.” He stated this occurred prior to the oyster reef grounding and, when he grounded the vessel, it was pulled off “sideways.”

[Redacted] stated he checked the bolts after groundings and that he was not familiar with the manufacturer’s instructions.

[Redacted] stated the boats are not used for instruction but rather for “recreation.” However, he stated Texas A&M offers courses on sailing, including offshore sailing instruction. In regards to who is qualified to crew the boats, he stated that he “goes off what the ‘safety officer’ says.”

He stated he could not provide a good chronology of repairs or haul outs because it would all be from memory.

[Redacted] stated: “We fair out the keel on all sail boats”; this is done with “one coat” of FRP.

He stated in April 2008, the Cynthia Wood was hauled out, the keel was faired out, the hull was sanded, and anti-fouling paint was applied. At that time, “four hairline cracks between the ribs and hull” were observed.

[Redacted] stated the Cynthia Woods was “inspected” before the race by “Dark Water Divers.” The hull was cleaned and the divers reported no problems.

In regards to the capsizing, [Redacted] stated he had spoken with [Redacted] and, prior to the capsizing, [Redacted] observed water intrusion between the hull and ribs. Additionally, he stated that Travis observed a keel bolt shoot out prior to the keel’s loss.

He stated T&T divers found Roger Stone “with a manila rope tied around his waist.”

During the salvage operation, [Redacted] stated [Redacted] told T&T Marine to “scuttle the boat” and two members were placed onboard the overturned hull with fire axes. He also stated “[Redacted] told us not to mark it.”

Prior to the end of the interview, the interviewers again asked [Redacted] about the availability of maintenance records; he again stated that the only maintenance records were onboard the vessel.
Photographs
USCG Tiger Team Report
UNITED STATES COAST GUARD
TIGER TEAM

THE S/V CYNTHIA WOODS LOSS
INVESTIGATION

GALVESTON, TEXAS

Performed by:
Ancon Marine Consultants, Inc.
Marine engineers
St. James City, Florida
Augusto (Kiko) Villalon, Pres.
Bill Richards, NA & ME
ANCON MARINE CONSULTANTS, INC.
MARINE ENGINEERS
ST. JAMES CITY, FLORIDA

A TIGER TEAM REPORT

November 16, 2008

TO: Commander Jim Elliott
CC: LCdr. Kevin Ivey
Lt. Timothy Tilghman
Chf. Kyle Chapman
Phil Cappel, USCG.
FROM: Augusto (Kiko) Villalon, President

Commander Elliot:

Following is my report on behalf of the Tiger Team, to add to the investigation your team has performed on the tragic incident of the sailboat Cynthia Woods of June 6, 2008. It has been my pleasure to work with the highly professional team of your Marine Safety Unit. I consider it an honor to have worked with such a group.

TIGER TEAM INVESTIGATORS:
Augusto (Kiko) Villalon, President, Ancon Marine Consultants, Inc.
Bill Richards, NA & ME, President, Bill Richards Yacht Design.
In the BADs of June 8, 2008 we reported:

06-08-08 GALVESTON, TX Coast Guard finds 5 missing sailors in Gulf yahoo.com (06-08-08) A Coast Guard helicopter crew early Sun. (06-08) rescued 5 regatta competitors who had drifted for 26 hr. in the Gulf of Mexico after their boat capsized. Rescuers were continuing to search for a missing sailor, identified as boat safety officer Roger Stone. The search started after the 38-ft. Cynthia Woods missed a radio check Sat morning (06-07). The crew included 4 college students and 2 safety officers. A helicopter crew from Air Station Houston pulled the 5 men from the water 23 mi. S of Freeport, Texas, Petty Officer Renee C. Aiello said Sun. (06-08). They had drifted about 5 mi. NW of their capsized boat. They were taken to the Univ. of Texas Medical Branch in Galveston, where all 5 were listed in good condition. They were suffering from sunburn and dehydration, said R. Bowen Loftin, CEO of Texas A&M at Galveston. Three of the students — Steven Guy, Joe Savana and Travis Wright — attend Texas A&M at Galveston, the school said in a news release. The 4th, Ross James Buzbee, attends Texas A&M in College Station. The other safety officer was identified as Steve Conway of Texas A&M at Galveston. The boat, which lost communication around midnight Fri. (06-06), was competing in the Regata de Amigos. The race, which covers 610 nautical mi. from Galveston to Veracruz, Mexico, started Fri. and continues into next week. CG officials said the keel of the overturned vessel was ripped off, indicating the sailboat may have hit something in the water. Race director Kevin Box said the loss of the keel can cause a boat to overturn in seconds. The 5 who were rescued stayed afloat with 4 life vests in 4-6-ft. seas, Loftin said. A few were below deck when the boat capsized. They said Stone was not among them when they went into the water. It was Conway who kept the group together in the water and used a flashlight to signal CG
searchers. The boat went missing 11 mi. S of Matagorda, which is about 110 mi. down the coast from Galveston.

BACKGROUND: The Cynthia Woods (hereinafter called the CW), a Cape Fear 38 racing sailboat built in September of 2005, and a sister-ship, the George Phydius, built in January of 2005, were donated to Texas A & M University by an alumnus for the school’s sailing program. The CW had been sailed and raced for some time, and it was recorded that in March of 2007 she suffered a “hard grounding” and subsequent towing over a shallow, rough bottom. There are also reports of other groundings. On March 12, 2007, after the hard grounding, the vessel was hauled out at the Payco Boatyard and some repairs were done by A & M students. The maintenance log of the vessel was lost in the swamping, and it is being reconstructed through the investigation led by Lt. Cdr. Ivey. The vessel was entered in the "Regata de Amigos," a yacht race from Galveston to Veracruz, Mexico. She was crewed by a captain, a co-captain, two safety officers and two students.

NARRATIVE: On Friday, June 6, 2008, the race was started off Galveston, TX. That night, at about 2345 hr. the safety officer on the “off” watch, noticed water coming into the hull. Shortly after this, the boat capsized with the loss of Roger Stone, one of the safety officers. The crew was composed of six men, all experienced sailors. The boat had proper equipment, including a GPS tracking device that was recovered after the capsizing. An EPIRB and an emergency life-raft were aboard, but the crew was not able to use them because they were improperly stowed (according to the race’s rules). Both devices were kept down below on the boat, and since the capsizing occurred just seconds
after the loss of the keel, they were not able to be deployed. The EPIRB would have alerted the USCG of the incident and pinpointed their location within 20 minutes. The life-raft would have provided a platform from which the crew could have been rescued. At the time of the swamping, Roger Stone heroically helped the two men who were sleeping below to get up through the hatch and out into the water. He himself was not able to get out of the cabin, and he drowned. The keel had completely separated from the hull, and the vessel capsized within seconds in rough seas at about midnight.

Rescue operations were initiated the following morning when the captain failed to report their position by radio. The five surviving crew members, who swam in the Gulf of Mexico for 26 hours, were eventually rescued by a US Coast Guard helicopter. The keel was miraculously located in 113 ft. of water and was retrieved. We were able to examine both the boat and the keel.

THE VESSEL: Cape Fear Yacht Works is the manufacturer of a model of sailing yacht called the Cape Fear 38. It also manufactures other custom or semi-custom boats. It is located in Wilmington, NC. The designer is Bruce Marek Yacht and Design Consultants, hereinafter referred to as MYD.

Model: Cape Fear 38 Regatta
HIN: UAR38007I505
LOA: 38 ft.
Beam: 8 ft-2 in.
Draft: 7ft-2 in. Displacement: 10,000 lb.
Keel weight: 4,500 lb.
Propulsion: Yanmar 29 HP Saildrive
Sail Rig: Sloop with retractable bowsprit for spinnaker work.
Power: Yamaha sail drive.
Interior: Port & starboard bunks in main saloon, small galley, head
and some storage. V-berth bunk forward of main bulkhead.

Note on the design of these boats: In the process of analyzing these vessels, it is important to understand that because of their use (racing) they are designed to be very light, with smaller safety factors than vessels for cruising or racer/cruiser use. The Cynthia Woods and the George Phydius were designed to the ABS (American Bureau of Ships) "Guide for Offshore Racing Yachts," and other accepted industry standards. What this means is that there is a greater factor of structural safety risk when sailing these racing vessels than there would be in a cruising sailboat. To give the reader a comparison, the CW displaced 10,000 lb., while other vessels of similar size classed as racer/cruisers would displace between 16,000 and 20,000 lb., and a strictly cruising boat of this size would displace up to 30,000 lb. Although it is not often that we see a keel separate completely from the hull, as in this case, this is by no means unheard of. Indeed, several years ago an America's Cup racing yacht, which was designed to the height of cutting edge technology, broke in two while racing, and sank. Therefore, the responsibility for maintenance on these vessels is much higher than on a cruising boat, since the risks taken at sea are also higher.

INVESTIGATION: The Tiger team was alerted and ordered to Galveston to aid the USCG Marine Safety Unit team in charge of this investigation.

We were asked to perform the technical part of the investigation and the Marine Safety Unit-Galveston group gave us all the support needed to complete the assignment.
Our team arrived in Galveston on Monday, June 23, 2008 and started work immediately with the local Coast Guard team.

General inspection of the vessel showed great damage to the hull laminate surrounding the keel-base area. Several of the six athwartship supporting floors forming part of the hull-bottom supporting grid were fractured. We examined both the construction drawings and the physical damage to the boat. Following are our findings.

**Hull bottom lamination around the keel area:** To starboard, at the leading edge of the keel, the hull’s main laminate was delaminated (peeled off) when the keel fell off to starboard (the vessel was on a port tack and heeled heavily to starboard). The delamination was in two places (when looking at a cross section), each roughly located at a third of the thickness, leaving three sheets of laminate with what appears to be fairly clean resin interface, and no white fiberglass fibers exposed, as would be evident on well bonded laminates. Most of this damage appeared to have occurred as a result of the keel ripping off. However, it is very possible that this actually occurred due to the grounding/towing incident of March, 2007 (which could have gone undetected), allowing the entire structure to flex under general sailing loads. To port the fractured edge seems to have failed under a shear load. It is a clean break all the way aft to the trailing edge.

**At the trailing edge:** The damage here suggested a strong rotation of the keel pushing up at this point and fracturing floors (structural beams) No. 3, 4 and 5 (See Sketch No. 1). Each one had a vertical fracture on or close to the centerline. An unnecessary 1.5-in. diameter hole was drilled across these floor
members, while an inspection of the sister-ship George Phydias shows small limber holes as cord sections of a circle some 5/8 inch in height, allowing for a stronger structural beam. The large size of these holes on the CW significantly reduces the strength and stiffness of the floors under grounding loads.

**Athwartships, along No. 5 Floor:** The forces that damaged the vessel fractured No. 5 floor and traveled along it to the port-side end of the floor, surfacing at a point on the turn of the bilge and some 39 in. from the keel (See Picture No. 1). There, a complete laminate fracture started and traveled some 24 in. up, in the direction of a line between the start of the fracture and the port-side chain plate.

**The keel and its attachment system:** The keel is made of a lead alloy and weighs nominally 4,500 lb. It is attached to the hull bottom with six bolts of different sizes with 3/8 steel plates inside, all in the pattern shown on the keel bolts attachment (See Sketch No. 2). We removed the keel bolts' nuts, washers and plates. The resulting data, including the torque force required to remove them, was recorded on Sketch No. 2. The laminate on the hull's centerline-overlapping area is 12 in. wide, and was carefully measured and found to be between .620 and .650 in. thick, while the designer required 1.0 in. in this area. The designer also required 1.0 in. in the engine-supports area, which we measured and found to be .427 in. thick.

In order to assemble data for our investigation, we selected 16 places on the hull where we drilled and pulled sample cores of the laminate. These were sent to a laboratory for professional analysis (See Appendix No. 4 and Appendix No. 9 for location).

An expert representing the manufacturer and the designer did
some Thermal Infra-Red Imaging, which corroborated our findings of delaminations occurring in the hull laminate, as well as in some floor flanges.

COMMENTS PRECEDING OUR CONCLUSIONS: We find that the tragedy of the Cynthia Woods was caused by a series of contributory actions that occurred prior to the swamping incident of June 6, 2008. The primary causative factor was the hard grounding of March, 2007, and a series of subsequent groundings that may have exacerbated damage that had already occurred. The falling off of the keel did not occur because of bad weather or normal racing loads. We concluded that the hard grounding resulted in internal damage (that occurs when the impact loads exceed the yield point of the different structural components). Most of this damage went unseen at that time. It was not repaired properly, and most of the damage continued to weaken the laminates around the keel area to the point of failure, which occurred on the night of June 6, 2008.

Following are our findings regarding the four "stakeholders" included in the history of the Cynthia Woods. We have collected data, studied pictures, reviewed interviews of the people involved with the vessel, performed parallel calculations to the designer's, collected core samples of areas of the hull which suffered the damage discovered, reviewed the laboratory results of the analysis of such samples, and have formed the opinions that are expressed below:

DESIGN:
Although we found some discrepancies in MYD calculations, with which we might disagree (all of these are detailed in Appendix 1), we find, and it is our opinion, that the structure as designed meets or exceeds the requisite standards and guidelines, using
industry-accepted values for the material physical properties. The vessel design was not a causative reason for the keel failure and subsequent tragic incident. We found that the original calculations were made using structural values of what we call "normal" materials (i.e. fiberglass mat and roving), while the CW was built with more sophisticated materials with higher structural values, which resulted in an additional safety factor inherent in the construction of the vessel.

CONSTRUCTION:
Regarding construction, we have to look at it from two points of view, which may differ from each other depending on construction procedures:

The intended construction by the manufacturer, which should follow the designer's instructions, in actuality differed from these instructions in some aspects, mentioned in Appendix 2. However, when we calculated the different components from samples taken, we find that the structure as built meets or exceeds the requisite standards and guidelines, using industry-accepted values for the material physical properties, providing that proper construction practices were followed. Indeed, portions of the as-built laminate thicknesses are thicker than the as-designed requisites and thus have an increased stiffness and strength.

The deficiencies noted concerning proper construction practices include the apparent surface of the delaminated areas, which may have been caused by improper lamination practice. These are clean and shiny, as opposed to the rough white fibers with a pulled-apart look that we would see when a healthy laminate is pulled apart by force. The deficiencies also include the large size of the limber holes
drilled after the CW's floors were laminated. On the sister ship George Phydias, these limber holes are smaller and seemed to have been formed at lamination time in the shape of half-circles on the flange of the floors.

OWNERS/MANAGERS
The group of people described under the heading of Owners/Managers includes A & M University employees, students, and non-student participants in the sailing program of the school, as listed below:

**Director, Physical Plant Marine Base**: This is the person responsible for supervising the Sailing Program Director, the marina employees, the facilities, the vessels, and all equipment related to the program. This person is, in fact, responsible for everything concerning the facilities and assets of the Sailing Program. The US Coast Guard investigating team interviewed Ms. Tammy Lobaugh, and a copy of this interview is available.

**Sailing Program Director**: This person reports directly to the Director of the Marine Base. This person is responsible for all the boats and equipment used for the sailing program of the university. At the time of the CW incident, Mr. Jim Atchley was the Program Director and therefore responsible for the management and maintenance of the Cynthia Woods. According to Ms. Lobaugh's interview (Director of the Marine Base), Mr. Atchley acted very independently and frequently did not communicate with her. Mr. Atchley has not been available for interviews subsequent to his original affidavit.

**Students**: Although the sailing program has a large number of students, there were, at the time of this incident, several students who were very involved with the racing and maintenance
of the CW. These students were under the direct supervision of Mr. Atchley and performed various repairs to the vessel after the grounding of March, 2007.

Non-student participants: One of the non-student participants, Mr. Roger Moore, was one of the two safety officers aboard the CW, and was the drowning victim of the capsizing incident. He was an A & M University part-time hiree not on the faculty. The other non-student participant (and the second safety officer aboard, a Mr. Conway) was a university staff member.

We find that this group (Ms. Lobaugh, Mr. Atchley, etc.) should have hired a professional surveyor to survey the vessel after the hard grounding; should have contacted both the designer and the manufacturer; and should have seen to it that the vessel was properly repaired. In reality, the actual repairs done were only a very few: inadequate “patching” of the floors, and some fiberglass added to the outside of the keel-to-hull joint area.

REPAIR YARD:
The fact that there was a local repair yard that had been used by the university to do maintenance and repair work on its vessels originally generated some comments concerning the quality and procedures used to repair the damage caused by the grounding of March, 2007. However, we found no evidence that the Payco yard was involved at all in the repairs done to the CW’s keel. We have reviewed the work orders filed with the yard on different occasions, and in no case have we found evidence that the yard performed work in excess of what is actually in those orders: namely, to haul out the vessel, clean the bottom, remove some caulking, and prepare the vessel for keel removal.
In our opinion, the Payco yard performed according to the orders
given to it by Mr. Atchley (See Appendix 3). A caveat should be mentioned here in case there are work orders other than the ones provided to us.

WHAT HAPPENED DURING GROUNDING
Reportedly, the Cynthia Woods suffered a serious grounding on or about March of 2007, followed by a towing of the vessel over a hard bottom for a fairly long stretch. At the moment of impact, the vessel reportedly was moving at six or seven knots. The impact exerted a large force that originated at the leading edge of the keel bulb, and moved along the structural components and hull reinforcements as follows (See sketch No. 1 and No. 3):

The geometric shape of the perimeter of the keel rotated aft about a point on the intersection of a vertical from the center of gravity to the intersection of the keel base and the hull (See sketch No. 1), thus creating enormous forces in a see-saw manner that:

- PUSHED UP the small triangular-shaped area of the aft 5 inches of the trailing edge of the keel base, deflecting the keel boss (or shim) as shown in Picture No. 2.
- PULLED DOWN the slightly larger triangular shape of the forward 5 inches of the leading edge of the keel base, separating it downwards as shown in Picture No. 3.

The forces concentrated on the trailing-edge base triangle traveled along structural members designed to absorb this energy, but in excess of the yield point of some areas as shown by fractures on the centerline of floors 3, 4 and 5 (See Pictures Nos. 8, 9 & 10).

These forces were definitely in excess of what the grid could stand, and continued their way along the port side of floor No. 5 to its end, where the forces created a serious, but at the time of the grounding probably not
easily visible, fracture of the laminate. The fracture continues from this incipient point we marked as No. 4 core (for sampling) on the port hull side (See Picture No. 1), traveling upwards for 24 more inches. This fracture can also be seen on the inside of the boat around the galley area and the aft end of the port bunk (See Pictures Nos. 4 & 5). The fractures were originally internal and they probably aggravated with the capsizing.

The forces generated on the forward triangle (the leading edge keel base) pulled down the laminate on both sides of the keel in an area probably the shape and size shown as shaded on Sketch No. 1. For some reason (unknown to us at this time but not unusual in these cases) the starboard side of this area de-laminated in two points of the roughly ⅛-inch thick bottom laminate shown in Picture No. 6.

These two large areas where the vessel’s laminate suffered damage were probably unseen at the time of the haul-out for repairs after the hard grounding. The vessel should have been submitted to a detailed survey, including a good “sound-tapping” and photographic thermal infrared imaging of the affected areas.

The damage had been done previously and not repaired, and the continuing use of the boat naturally allowed the fiberglass failure to grow, probably making the keel swing sideways until this motion exceeded the keel’s strength, at which point the catastrophic failure occurred.

WHAT HAPPENED AFTER THE GROUNDING:
As well as we were able to ascertain, repairs to the grounding damages were limited to patching the cracks approximately in the
centerline area of the transverse floors, and to the addition of a layer or two of fiberglass to the outside surface of the keel-to-bottom area. We ground (with an electric grinder) some areas around the keel in a pattern which revealed layers outside of the definitely different (red) color of the original laminate. From these areas we determined the amount of fiberglass added in the "repairs" (See the final laboratory results in Appendix No. 4).

Proper repair of a very light racing hull such as the CW would have required: first, an extensive survey and consultation with the designer and the manufacturer; second, the removal of most of the saloon’s built-in furniture and floorboards covering the structural supporting grid of stringer/girders and transverse floors; third, proper reinforcement of this grid, following the manufacturer’s recommendations, as well as the designer’s and the surveyor’s specific instructions.

Interviews with two students involved in the repairs reveal an unprofessional and unsafe approach to these repairs. The students’ instructions were to grind and laminate some glass material with epoxy resin over the fractures on the center area of the floors. One of the students had recommended that more work be done, since the floor beams’ flanges were delaminated in portions of their length; this work was not done. Fiberglass was also added to the exterior of the keel-to-hull interface area.

FAILURE ASSESMENT (See Appendix No. 2):
Based on our investigation and findings, we submit the following four possible scenarios:

1) The ultimate failure of the keel attachment to the hull is the direct result of improper repair of the failed keel floors. The cracked floors were basically “patched” (See
Picture No. 7). The structural integrity of these floors was not restored to its original design or as-built condition. Failure of these floors to adequately absorb and transmit loads placed increased stress on the remaining structure. In addition, the failed floors aft would allow the hull to flex to a greater extent than the original design allowed. When the keel failed, the inter-ply delamination occurred. Or,

2) The ultimate failure of the keel attachment to the hull is the direct result of improper repair of the failed keel floors AND the inter-ply delamination. This is a more severe condition than that defined in No.1 above, and would mean that the damage to the keel floors and the delamination occurred as a result of grounding. Again, the cracked floors were basically “patched,” and they could not transmit the stresses properly. The additional weakening of the structure from the inter-ply delamination would have exacerbated the problem of insufficient structure to transmit the keel loads. Or,

3) The ultimate failure of the keel attachment to the hull is the direct result of improper repair of the failed keel floors and resultant delamination of a portion of the hull laminate. The cracked floors were basically “patched.” The structural integrity of these floors was not restored to its original design or as-built condition. Failure of these floors to adequately absorb and transmit load placed further stress on the remaining structure. Additionally, the failed floors aft would allow the hull to flex to a greater extent than the original design permitted. This event could lead to the delamination mentioned in No.2 above, which would compromise a very
large part of the structure, leading to even greater flexing of the structure. Or,

4) The crack on the port side, along with the cracked secondary bonds, most likely occurred from the loads imposed by grounding. This type of crack is predictable when the design grounding loads are exceeded, and it results from the rear end of the keel levering vertically upwards. Loads emanate from the load source into the keel floors and the hull skin itself. Perhaps this failure remained inter-laminar and was not visible. It ultimately manifested in a catastrophic failure.

STRUCTURAL CALCULATIONS: Our team reviewed the as-designed MYD calculations. We also performed as-built calculations using information from the actual laminate from the core samples tested by Structural Composites, Inc. Results and comments are in Appendix No. 1.

WHAT SHOULD HAVE BEEN DONE:
The main failure of the A & M University personnel was to make their own decisions without the benefit of a professional survey, and without the involvement of the designer and the manufacturer. These were all required in order to establish a good assessment of the damage, based on structural studies that would have been able to accurately pinpoint the damage and predict the ultimate failure if the damage was not properly repaired. Indeed, a virtually identical scenario of the result of a hard grounding or docking of a fin-keel type vessel such as the CW is part of a textbook on the design of these areas. The book Principles of Yacht Design (Larson and Eliasson), on page 216 and following, shows a diagram that explains exactly what happened to the Cynthia Woods. A survey of the CW would have revealed
precise prediction data on the probable extent of the damage (See Appendix No. 5).

In engineering analysis, we can state that when the forces exerted over a structural component exceed its yield point, noticeable failure occurs. Therefore, we can establish the corollary as... When certain noticeable damage is observed on a structural component, we can say with a high degree of engineering certainty that structural damage has been experienced by that component.

The following noticeable diagnostic symptoms of failure of structural components of the Cynthia Woods, when she was hauled out after the grounding for observation and repairs, were available to the university personnel responsible for the management and maintenance of the vessel:

- Pictures 1 and 2 clearly show a "gap" that formed at both the leading and the trailing edges of the keel. This gap, which was formed by pressure on the tip of a "malleable" lead keel, was not present before the grounding, or at least not reported as such. These two areas where the keel was "crushed" down must have been interpreted as "noticeable damage observed on a structural component."

- Pictures No. 8, 9 & 10 show fractures of floors no. 3, 4, and 5. These fractures were not there prior to the grounding, since they had not been reported or repaired before. These fractures, if properly analyzed, would have told the surveyor that, besides a vertical fracture, he should assume that the flanges of the beams would have been submitted to high stress and that delamination could be present. This would have been interpreted as "noticeable damage observed on a structural component."
The report from one of the students that he did observe some delamination of flanges while he was doing repairs should have told a surveyor that, in all probability, there was more of this delamination. Indeed, he would have been obliged to look for this problem. Listening to the student's observations should have been interpreted as "noticeable damage observed on a structural component."

Therefore, based on our inspection, investigations, sampling and analysis of structural components, calculations, reviewing interviews, and based on our extensive experience in working in design, manufacturing, testing, and repairing fiberglass boats, we conclude that the Cynthia Woods keel-loss incident occurred because of the failure of the Director of the Sailing Program to respond to the grounding incident in a professional manner, which should have included a survey and consultations with the designer and manufacturer.

[Signature]
Augusto (Kiko) Villalon, Pres.
Ancon Marine Consultants, Inc.

[Signature]
William Richards, NA & ME
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MARINE ENGINEERS
ST. JAMES CITY, FLORIDA

TIGER TEAM INVESTIGATION
THE CYNTHIA WOODS CAPSIZING

INDEX OF ADDENDA

SKETCHES
Sketch No. 1—Effects of March, 2007 grounding/towing
Sketch No. 2—Keel bolts' pattern and information
Sketch No. 3—Cross-section of hull at floor No. 5

PICTURES
Picture No. 1—Hull fractures at end of floor No. 5
Picture No. 2—Trailing edge of keel at hull joint
Picture No. 3—Leading edge of keel at hull joint
Pictures No. 4 & 5—Hull fractures seen from inside
Picture No. 6—Delamination area of hull at starboard side of keel
Picture No. 7—"Patching" work performed on floors
Picture No. 8—Fracture at Floor No. 3
Pictures No. 9 & 10—Fractures at floors Nos. 4 & 5
Picture No. 11—The Cynthia Woods hauled at Payco Boat Yard
Picture No. 12—Front end of keel bulb

APPENDICES
Appendix No. 1—Structural Calculations by Tiger Team
Appendix No. 2—Failure Analysis by Tiger Team
Appendix No. 3—Payco Boat Yard work orders--summary
Appendix No. 4—Laboratory core sample analysis results
Appendix No. 5—Principles of Yacht Design selected section
Appendix No. 6—Design Standards reference list
Appendix No. 7—Other documents used in investigation
Appendix No. 8—Marek Yacht Design's Book of calculations and hull print
Appendix No. 9—Core Sample locations diagram
Appendix No. 10—Tiger Team Structural Calculations
Picture No. 1
(P-1)
The end of No. 5 floor to port, where the grounding forces traveled and fractured the hull. Originally these were probably unseen.

The fracture continued up toward the port chain plate. These fractures were probably originally unseen.
Picture No. 2
(P-2)
Trailing edge of the keel. When the vessel grounded hard, the keel rotated aft and the malleable lead was crushed down as the hull deflected up. Notice that the separation occurred between the keel boss and the keel. Observation of this damage should have been a warning that it was a symptom of a serious problem.
Picture No. 3
(P-3)
Leading edge of the keel, showing the separation between the keel boss and the hull due to the hard grounding of March, 2007. This gap is an indication of the damage suffered by the boat when grounded. It was a significant warning that a professional surveyor should have been engaged to investigate further.
Picture Nos. 4 & 5
(P-4 & 5)
Picture No. 6
(P-6)
The section of the hull, on the starboard side of the keel, where the delamination occurred in two points of the cross-section of the hull’s main laminate.

Notice the clean, smooth separation, as opposed to laminate that has been torn apart and shows white fibers, indicating a laminate with good bonding.

This delamination probably occurred internally at the time of the grounding/towing incident, and was aggravated later under normal sailing loads.
Picture No. 7
(P-7)
After the grounding/towing incident of March, 2007, the vessel was hauled and A & M University students patched the cracks here visible on the forward face of floors No. 4 and No. 5.

Notice the “patches” made with bi-axial material, simply covering the damaged area. The entire stringer/girder grid should have been completely re-done, due to the delamination of the flanges reported by a student.
Picture No. 8
(P-8)
This is the aft face of floor No. 3. Notice the vertical fracture created by the forces of the grounding/towing of March, 2007

Pictures 9 & 10 on next page show the same damage on floors No. 4 & 5.
Picture Nos. 9 & 10
(P-9 & 10)
Picture No. 11
(P-11)
The Cynthia Woods, a Cape Fear 38, property of Texas A & M University, shown hauled out at the Payco Boat Yard after a hard grounding that occurred in March of 2007.

The leading tip of the keel bulb hit a rock.

The mark can be seen in Picture No. 12
Picture No. 12
(P-12)
Leading tip of the keel bulb showing some crushing due to the hard grounding of March, 2007.
Sketch No. 1
(S-1)
SKETCH NO. 1

Effect of grounding/towing incident

Drawn by: Kiko Villalon
(not to scale)
Sketch No. 2
(S-2)
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<th>Nut #</th>
<th>Wash</th>
<th>Plate #</th>
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<td>1-CW</td>
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<td>6-C</td>
<td>6-CW</td>
<td></td>
<td>1</td>
<td></td>
<td>30</td>
<td></td>
</tr>
</tbody>
</table>
Sketch No. 3
(S-3)
SKETCH NO. 3
How grounding forces travelled

Forces travelled along No. 5 floor

Fractures occurred on this point and up on this area

No. 5 Floor beam

Impact force created compression on the trailing edge area

Typical hat section floor beam with flanges laminated to hull

Keel bulb

Drawn by: Kiko Villalon
(Not to scale)
Appendix No. 1
(AP-1)
BILL RICHARDS YACHT DESIGN  
1162 ANTHONY ROAD  
PORTSMOUTH, RI 02871  
(VOICE) 401-529-4842  
(FAX) 617-633-6588  
brichards@ivcco.com

STRUCTURAL CALCULATIONS REPORT  
CAPE FEAR 38 S/V CYNTHIA WOODS

At the request of the Tiger Team investigating the keel attachment failure of the referenced vessel, Marek Yacht & Design (hereafter MYD) submitted a manual of calculations relating to structural aspects of the hull and keel. Nearly 50 pages of drawings, calculations and reference materials have been reviewed for completeness, accuracy, and application of available standards. Certain included documents are annotated by MYD for clarification and explanation.

CALCULATION STANDARDS

1) For calculation of the hull skin thickness, keel floors, keel bolts and backing plates, MYD referenced industry accepted standards, primarily ABS, with secondary calculation checks from 2 additional reference publications.

2) Material physical properties reference industry standard publications and manufacturer data sheets.

COMMENTS ON CALCULATIONS

1) It is clear from the Hull Lamination Plan, that the designer requested a thickness of nominally 1" on centerline. However, when the laminate layers are summed as defined in the lamination notes, this thickness cannot be achieved. MYD has provided several pages of documentation clarifying the "as built" laminate. In particular, it is stated that there is additional laminate provided in between the keel floors after the installation of those floors.

a) The sample cores support no evidence that this additional laminate was installed.

b) The additional laminate (3 x CM2408) would add approximately 0.15" to the base laminate, yielding a thickness in the keel floor bays of nominally 0.7", still far short of the 1" required thickness.

2) Calculation summary sheets are provided for the hull skin thickness required for stiffness and strength. In all cases, the laminate thicknesses meet or exceed the requirements of the ABS standard.
3) Calculation summary sheets are provided for each of the keel floors. These calculations define the section modulus of the floors and must equal or exceed a minimum required section modulus (SM<sub>top</sub> and SM<sub>bottom</sub>), as defined in ABS. In all cases, the section modulus achieved with the structure as designed, meet or exceed the requirements of the standard. It is important to note that the base laminate bottom thickness enters into this calculation. Referencing 1(b) above, the "additional laminate is not included in the MYD summary of calculations. However, MYD assumed a bottom thickness of 0.50" (see #4) when making these calculations. These calculations encompass two primary conditions; the loads induced when sitting and the loads induced by grounding. The grounding aspect further includes two separate conditions; the loads induced by striking an underwater object with the leading tip of the keel (horizontal grounding) and the loads induced by a vertical grounding.

4) MYD used 1.1" for the bottom thickness on the general calculations for floor #5; not sure of the reason for this.

5) MYD used an "E" value of 3.63 for the stringer cap when in fact it should be 1.00, as the stringer cap is laminated from base material.

6) The calculations for the keel bolts were checked for accuracy. Since there is no keel bolt failure in this case, there was no further review of these.

**ADDITIONAL CALCULATIONS**

1) A simple additional calculation was performed by the Tiger Team to insure that the structure as designed was adequate from the standpoint of a laminate shear load, generated by the moment of the keel on the hull laminate as defined by the plan-form outline of the keel root. This calculation resulted in a design factor of safety of nominally 6. This is a more than acceptable factor of safety. See Attachment A.

2) Floor #5 was recalculated using .50" thickness to conform to the calculations for the other floors. See Attachment B.

3) All floors were recalculated using the correct "E" value for the stringer top. See attachment B

**CONCLUSIONS-AS DESIGNED**

The practice of adding additional laminate between the keel floors, post keel floor lamination, while certainly contributing to the structural integrity, is not really the best practice. Since this laminate does not extend "under" the core area of the keel floors, it certainly cannot be counted in the SM calculations. Additionally, it could contribute to
stress concentration, as the keel floor secondary bond and this extra laminate terminate at a common intersection. However, as noted above, there was no evidence that this laminate was installed.

The above comments aside, the structure as designed meets or exceeds the requisite standards and guidelines, using industry accepted values for the material physical properties.

**AS BUILT CALCULATIONS**

1) A simple additional calculation was performed by the Tiger Team to insure that the structure as built was adequate from the standpoint of a laminate shear load, generated by the moment of the keel on the hull laminate as defined by the planform outline of the keel root. This calculation resulted in a design factor of safety of nominally 3.5. This is an acceptable factor of safety. See attachment A.

2) Recalculation of the keel floor laminates was not performed against the nominal as built condition to determine adequacy of the structure. The reason is that the as built thickness of the laminate in the keel area is thicker than the figures used in the "as designed" re-calculation, thus increased the stiffness and strength of the structure.

**CONCLUSIONS-AS BUILT**

The structure as built meets or exceeds the requisite standards and guidelines, using industry accepted values for the material physical properties. This of course assumes proper constructions procedures were adhered to during the construction process.

Respectfully submitted,

Bill Richards, NA&ME
11/2/08
Appendix No. 2
(AP-2)
The Tiger Team has reviewed the design standards used in the design of the referenced vessel and found that the vessel structure meets or exceeds industry standards.

The Tiger Team has performed re-calculations against the same design criteria and found that the “as built vessel”, as best we can determine what that is, meets or exceeds industry standards.

The facts of the investigation support the following:

1) The laminate in way of the keel root does not meet all criteria as defined in the Hull Lamination Drawing.

2) Inter-ply delamination, outboard and to starboard of the keel & covering a significant area, occurred at some point in the vessels use. The delamination is a very clean separation between plies and this is generally indicative of improper lamination techniques.

3) The vessel was grounded on more than one occasion. In at least one of these instances, the vessel was towed a significant distance, subjecting the vessel to further impacts to the keel and thus the hull structure.

4) The failed keel floors, resulting from the groundings, were not repaired by professional technicians.

5) There was no survey of the hull structure following the groundings.

6) There is a large hull crack in the port side, along with other internal damage.

Possible failure scenarios:

1) The ultimate failure of the keel attachment to the hull is the direct result of improper repair of the failed keel floors. The cracked floors were basically “patched”. The structural integrity of these floors was not restored to their original design or as built condition. Failure of these floors to adequately absorb and transmit loads placed increased stress on the remaining structure. Additionally, the failed floors aft, would allow the hull to flex to a greater extent than the original design. When the keel failed, the inter-ply delamination occurred.
2) The ultimate failure of the keel attachment to the hull is the direct result of improper repair of the failed keel floors AND the inter-ply delamination. This is a more severe condition than defined in (1) and would mean that the keel floors and the delamination occurred as a result of grounding. Again, the cracked floors were basically “patched” and could not transmit the stresses properly. The additional weakening of the structure from the inter-ply delamination would have exacerbated the problem of insufficient structure to transmit the keel loads.

3) The ultimate failure of the keel attachment to the hull is the direct result of improper repair of the failed keel floors and resultant delamination of a portion of the hull laminate. The cracked floors were basically “patched”. The structural integrity of these floors was not restored to their original design or as built condition. Failure of these floors to adequately absorb and transmit load, placed further stress on the remaining structure. Additionally, the failed floors aft, would allow the hull to flex to a greater extent than the original design. This event could lead to the delamination in item (2), which would compromise a very large part of the structure, leading to even greater flexing of the structure.

4) The crack on the port side, along with the cracked secondary bonds, most likely occurred from the loads imposed by grounding. This type of crack is predicted when the design grounding loads are exceeded and results from the rear end of the keel levering vertically upwards. Loads emanate from the load source into the keel floors and the hull skin itself. Perhaps this failure remained inter-laminar and was not visible. It ultimately manifested in a catastrophic failure.
Appendix No. 3
(AP-3)
11-18-05
Work order: TAMU L641437
Description: Commissioning of Cape Fear 38' sailboat "Cynthia Woods"
11-18-05
Work order: Payco 2283
1.5 hr. wipe down hull
0.5 hr. taping waterline
2.0 hr. Move hand-rail, plug old holes
6.0 hr. stripping wax from bottom
2.0 hr. cherry picker + one extra man lift keel off truck, set keel to install on hull
3.0 hr. Remove rudder from inside hull, install rudder, bolt hook up steering arm linkage
Work order: Payco 3177
4.0 hr. Paint hull, rudder and thru-hulls
1.0 hr. Paint prop & hull touch-up
2.0 hr. Labor R & R rudder stop bracket & steering linkage
Work order: Payco 3176
1.0 hr. R & R steering bracket arm
2.0 1.0 hr. Cherry picker set mast + men
1.0 hr. Prime prop and install
Welding by Gam to fabricate heavy Alum steering stops
Re-lift hull off stands w/travel lift, move boat & set up keel, reblock.
Total work and materials........................................ $2,774.58

Procedure: Atchley wrote PO from the University and Payco did the job, accounted for and billed the U. Payco performed as asked.

3-12-07
Purchase Order: TAMU L744206 (Not attached)
Description: Repair Keel
Work order: Payco 2536
2.5 hr. wash down bottom
Re-lift boat w/travel lift to remove keel from hull
9.0 hr. Remove old caulking from hull and install new caulking to keel & hull attachment point
8.0 hr. Sand and scrape below waterline as req. to prepare for paint. Apply paint
3-23-07
Work order: Payco 4009
Materials only
Procedure: This was the keel repair after the March 2007 grounding. TAMU issued a P.O. to “repair keel”, no other explanations. There is a Galveston Yacht Service, Inc. Work order which states:
1.- Haul out and Launch
2.- Pressure wash the hull
3.- Texas A & M will do all repairs some

On the work orders and invoices there is no mention of other work than the noted above.
4-6-07 Payco invoices some of the worked performed from 3-12-07 to 4-5-07 when boat was re-launched

**Conclusions:** Texas A & M personnel did the actual repairs to the floors Nos. 3, 4 and 5 plus the fiberglass material added to the outside of the keel and hull bottom. Payco performed as asked. Boat remained on yard some 24 days.

There is no evidence of surveys or written instructions to Payco, there is no evidence in the way of work orders or notations of work done other than what is described above. Hence the keel damage assessment, and the complete keel repairs must have been done by TAMU personnel.

4-22-08

Purchase order: TAMU L 843853

Bottom painting.

Routine work to wash, scrape and paint bottom.

There is a mistake which was approved by Mr. Atchley: Entry, 2.25 hr. labor to power wash and scrape..... 50.00/hr = 225.00

The charge should have been $112.5

NOTE: The mistake was made on work order 2757, the invoice, No. 4279 changes the hours to 4.5.
Appendix No. 4
(AP-4)
Structural Composites Report Number:
SCL 8015-160

Data Summary for:
Ancon Marine Consultants Inc
3859 Cruz Drive
St. James City
FL
33956

Attention:
Augusto "Kiko" Villalon
10 September 2008

Mr. Augusto (Kiko) Villalon
Ancon Marine Consultants Inc.
3859 Cruz Dive
St. James City, FL 33956

Re: S/V Cynthia Woods

Dear Mr. Villalon,

I have completed the testing on the samples received from the USCG Marine Safety Unit Galveston. These samples were received on July 14th, 2008. The samples were contained in sealed evidence bags. This report contains the results of this testing process.

Procedure

The procedure for testing of the samples was provided by the USCG (see J.E. Elliott letter dated 07 July 2008). This involved recording of the sample dimensions, removal of coatings, resin burn-out, and laminate ply-by-ply analysis.

As each sample was removed from the evidence bag, the date opened was recorded directly on the bag. The laminate thickness was measured in four places, spaced 90 degrees apart. The presence of any coatings was noted, and their thickness estimated.

Prior to testing, the coatings were mostly removed. This was accomplished by grinding down the surface until resin and reinforcement were just beginning to be visible. At this point the grinding was stopped, so as not to remove reinforcement. Thus the samples were tested with a slight amount of residual coating on the specimen (where coating was present).

In some cases, the samples were cut in half prior to test. After dimensioning and weighing, the specimens were placed in ceramic crucibles for resin burn-out. The crucibles were then placed in a muffle furnace, and heated to a temperature of 1050°F, for a minimum of 3 hours. This procedure corresponds to ASTM D2584, "Standard Test Method for Ignition Loss of Cured Reinforced Resins".

After the resin had been completely burned out of the laminate stack, the crucibles were removed from the oven. The remaining reinforcement was then weighed, for the resin:reinforcement ratio calculation.
The ply-by-ply laminate schedule was then determined, by separating out the individual plies of reinforcement in the laminate stack. These individual plies were weighed, so that the approximate areal weight of reinforcement (oz/ft² or oz/yd²) could be calculated. An individual report was generated for each sample. The report contains the average thickness of each sample, the resin/reinforcement content (weight %), and the results of the ply-by-ply reinforcement analysis.

Respectfully Submitted,

[Signature]

Arthur R. Wolfe
Vice President
General Notes on Testing & Analysis of the Samples:

1. Many of the samples contained a fiberglass/Kevlar hybrid reinforcement near the outer hull surface. This ply was usually just inboard of the outermost +/- 45° fiberglass ply. As the Kevlar was burned out along with the resin, the weight of Kevlar was estimated, and considered in the calculation of reinforcement content.

2. Coatings, where present, are indicated on the report sheets. The thickness of the coatings was estimated visually, and by use of a micrometer.

3. The alignment of the reinforcement plies was generally in very good agreement with the lines drawn on the samples. Any plies where the alignment seemed to be off of the marked axis are noted below.

4. Several of the samples seemed to contain a ply or two of reinforcement, and perhaps putty, which had been added to the exterior surface, over a paint or gelcoat layer. These are noted in the reports. It was not possible to remove these plies and test them separately. The entire sample was tested as one piece.

5. The sample thickness as shown on the report sheets reflects the average value after removal of coatings.

6. The estimated accuracy of the reinforcement weights as reported is +/- 10%, due to weighing errors, dimensional errors, variability in areal weight of reinforcements, deviations from nominal areal weight of reinforcements, draping of fabric during handling, etc.
Individual Notes on the Samples:

1. Sample #001 – The sample contained a ply of 0/90 hybrid reinforcement (glass/Kevlar) just beneath the exterior ply of +/- 45° glass reinforcement. This could not be removed prior to test. Coatings included blue paint (1-2 mils) and white gelcoat (~20 mils) outer, and white paint/gel (~3 mils) inner.

2. Sample #002 – There were no coatings on this sample. The exterior surface appeared to be glossy resin. The sample consisted of an outer FRP skin, with some attached foam core. The foam core was ground off prior to test. Also, the outer FRP skin was cracked upon receipt.

3. Sample #003 – This sample has a very thin (~2 mils) exterior white coating. The FRP skin was cracked upon receipt. The adhering foam core was removed prior to test.

4. Sample #004 – The sample was wet (damp) upon receipt. There were interlaminar fractures (delaminations) near the outer and inner surfaces. The outer surface was coated with blue paint (~2 mils) and white gelcoat (~20 mils). The sample was dried prior to test. This sample contained the same glass/Kevlar hybrid ply indicated in #001 above.

5. Sample #005 – This sample was also delaminated at 2 places within the laminate stack. The outer surface was coated with blue paint (~2 mils), a thin putty/glass layer, and thin white gelcoat. The inner surface was coated with white gelcoat (~25 mils). The sample appeared to have had some plies added to the exterior surface (putty, cloth, woven roving). The sample was dried prior to test. This sample contained the same glass/Kevlar hybrid ply indicated in #001 above.

6. Sample #006 – The sample contained several partial plies of reinforcement (areas where the ply of reinforcement did not extend across the entire surface of the sample). Therefore, this thickness varied between 0.56” and 0.89”. Coatings included blue paint (1-2 mils) and white gelcoat (~18 mils) outer, and white paint/gel (~2 mils) inner. This sample contained the same glass/Kevlar hybrid ply indicated in #001 above.

7. Sample #007 – No coatings were present. The outer FRP skin was removed from adhering green foam core prior to test.

8. Sample #008 – The exterior surface was coated with white paint or gelcoat (thickness 10-14 mils). This sample also contained what appeared to be unidirectional carbon reinforcement. The weight of the carbon reinforcement has been estimated.

9. Sample #009 – This sample contained some partial plies. There was a delamination approximately 3/8 of the way inboard from the outer surface. The sample thickness varied from 0.58” - 0.87”. Coatings present were outer blue paint (1-2 mils), beneath which was white gelcoat (10-14 mils). The inner surface was coated with whit gel/paint (5-7 mils). This sample contained the same glass/Kevlar hybrid ply indicated in #001 above.

10. Sample #010 – Partial plies were present on the inner surface. These partial plies were delaminated upon receipt. Coatings included blue paint (1-2 mils) on the outer surface, and white paint/gelcoat on the inner surface (8-15 mils). Glass
reinforcement and putty were evident between the outer blue paint and the outer gelcoat, perhaps indicating a repaired area. This sample contained the same glass/Kevlar hybrid ply indicated in #001 above.

11. Sample #011 – The sample had blue paint on the outer surface (1-2 mils), followed by white gelcoat (~20 mils). There was no coating on the inner surface. This sample contained the same glass/Kevlar hybrid ply indicated in #001 above.

12. Sample #012 – No coatings were present on the sample. The outer surface appeared to be glossy resin. A small amount of foam remaining on the back surface was removed prior to test.

13. Sample #013 – Coatings present included blue paint (2-3 mils) on the exterior, followed by white gelcoat (22-24 mils). An interior white coating was 1-2 mils thick. The sample contained numerous partial plies. The sample thickness was approximately 0.7”-0.8”, going up to 0.87” in the area of partial plies. This sample contained the same glass/Kevlar hybrid ply indicated in #001 above.

14. Sample #026 – This sample two distinct laminates in one piece. The overlying “keel to hull mating plate” was removed prior to test. The mating plate was bonded directly to the exterior gelcoat surface. This sample contained the same glass/Kevlar hybrid ply indicated in #001 above.

15. Sample #027 – This sample was similar to #026.

Respectfully Submitted,

Arthur R. Wolfe
Vice President
## FRP Laminate Analysis

**Sample #001**

**Vessel:** SV Cynthia Woods

**Laminate Ply-by-Ply Analysis**

(hole saw cutout received)

<table>
<thead>
<tr>
<th>Ply</th>
<th>Material</th>
<th>Approximate Weight</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outer Surface</td>
<td></td>
<td></td>
<td>(blue paint ~1 mil, white gel ~20 mils)</td>
</tr>
<tr>
<td>1</td>
<td>CS</td>
<td>1.0 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>+/45 KN BX</td>
<td>12.3 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0/90 KN BX</td>
<td>~23 oz/yd²</td>
<td>(Glass/Kevlar hybrid, estimated weight)</td>
</tr>
<tr>
<td>4</td>
<td>CS</td>
<td>0.7 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0/90 KN BX</td>
<td>25.9 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>CS</td>
<td>0.9 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>0/90 KN BX</td>
<td>24.0 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>CS</td>
<td>0.6 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>0/90 KN BX</td>
<td>25.2 oz/yd²</td>
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<tr>
<td>10</td>
<td>CS</td>
<td>0.9 oz/ft²</td>
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<tr>
<td>11</td>
<td>+/-45 KN BX</td>
<td>12.1 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>CS</td>
<td>1.0 oz/ft²</td>
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<td>13</td>
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<tr>
<td>14</td>
<td>CS</td>
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<td>18</td>
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<tr>
<td>19</td>
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</tr>
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<td>20</td>
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<tr>
<td>21</td>
<td>0/90 KN BX</td>
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<td></td>
</tr>
<tr>
<td>22</td>
<td>CS</td>
<td>1.1 oz/ft²</td>
<td></td>
</tr>
</tbody>
</table>

**Inner Surface**

- - - (white gel/paint ~3 mils)

**Average Thickness**

0.604 in.

**ASTM D 2584**

- Resin Content: 53.0 % by weight
- Reinforcement Content: 47.0 % by weight

**Notes:**

Values represent the results from 1 test specimen (ASTM D 2584).

CS = chopped strand, KN BX = knitted biaxial, WR = woven roving

I hereby certify that the test results contained in this report are true and accurate within the limits of the measuring devices employed. All mass and dimensional measuring devices are calibrated according to ASTM standards. The test equipment is calibrated with standards traceable to NIST.

Arthur R. Wolfe
Vice President
**FRP Laminate Analysis**

**Sample #002**

**Vessel:** S/V Cynthia Woods

**Laminate Ply-by-Ply Analysis**

(hole saw cutout received)

<table>
<thead>
<tr>
<th>Ply</th>
<th>Material</th>
<th>Weight</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>WR</td>
<td>20.8 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>WR</td>
<td>22.3 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>KN BX</td>
<td>11.6 oz/yd² (partial ply)</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>CS</td>
<td>0.8 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0/90 KN BX</td>
<td>17.9 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>0/90 CS</td>
<td>0.6 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>0/90 KN BX</td>
<td>17.0 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>CS</td>
<td>1.5 oz/ft²</td>
<td></td>
</tr>
</tbody>
</table>

**Outer Surface**

**Inner Surface** -

**Average Thickness**

0.231 in.

**ASTM D 2584**

- Resin Content 50.9 % by weight
- Reinforcement Content 49.1 % by weight

**Notes:**

Values represent the results from 1 test specimen (ASTM D 2584).

CS = chopped strand, KN BX = knitted biaxial, WR = woven roving

I hereby certify that the test results contained in this report are true and accurate within the limits of the measuring devices employed. All mass and dimensional measuring devices are calibrated according to ASTM standards. The test equipment is calibrated with standards traceable to NIST.

Arthur R. Wolfe
Vice President
FRP Laminate Analysis

Sample #003
Vessel: S/V Cynthia Woods
Laminate Ply-by-Ply Analysis

(hole saw cutout received)

<table>
<thead>
<tr>
<th>Ply</th>
<th>Material</th>
<th>Weight</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0/90 KN BX</td>
<td>20.9 oz/ yd²</td>
<td>(white paint/gel ~2 mils)</td>
</tr>
<tr>
<td>2</td>
<td>CS</td>
<td>0.9 oz/ ft²</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0/90 KN BX</td>
<td>18.0 oz/ yd²</td>
<td>(partial ply)</td>
</tr>
<tr>
<td>4</td>
<td>CS</td>
<td>0.6 oz/ ft²</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0/90 KN BX</td>
<td>20.6 oz/ yd²</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>CS</td>
<td>1.0 oz/ ft²</td>
<td></td>
</tr>
</tbody>
</table>

Inner Surface
- - - (foam core)

Average Thickness 0.168 in.

ASTM D 2584
- Resin Content 51.1 % by weight
- Reinforcement Content 48.8 % by weight

Notes: Values represent the results from 1 test specimen (ASTM D 2584).
CS = chopped strand, KN BX = knitted biaxial, WR = woven roving

I hereby certify that the test results contained in this report are true and accurate within the limits of the measuring devices employed. All mass and dimensional measuring devices are calibrated according to ASTM standards. The test equipment is calibrated with standards traceable to NIST.

Arthur R. Wolfe
Vice President
FRP Laminate Analysis

Sample #004
Vessel: S/V Cynthia Woods
Laminate Ply-by-Ply Analysis (hole saw cutout received)

<table>
<thead>
<tr>
<th>Ply</th>
<th>Material</th>
<th>Weight</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CS</td>
<td>2.6 oz/ft²</td>
<td>(blue paint ~1 mil, white gel ~20 mils)</td>
</tr>
<tr>
<td>2</td>
<td>+/-45 KN BX</td>
<td>14.0 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0/90 KN BX</td>
<td>~18 oz/yd²</td>
<td>(Glass/Kevlar hybrid, estimated weight)</td>
</tr>
<tr>
<td>4</td>
<td>CS</td>
<td>0.9 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0/90 KN BX</td>
<td>25.2 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>CS</td>
<td>0.9 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>+/-45 KN BX</td>
<td>12.4 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>CS</td>
<td>1.4 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>0/90 KN BX</td>
<td>25.7 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>CS</td>
<td>0.7 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>0/90 KN BX</td>
<td>22.2 oz/yd²</td>
<td></td>
</tr>
</tbody>
</table>

Average Thickness 0.462 in.

ASTM D 2584
Resin Content 54.9 % by weight
Reinforcement Content 45.1 % by weight

Notes: Values represent the results from 1 test specimen (ASTM D 2584).
CS = chopped strand, KN BX = knitted biaxial, WR = woven roving

I hereby certify that the test results contained in this report are true and accurate within the limits of the measuring devices employed. All mass and dimensional measuring devices are calibrated according to ASTM standards. The test equipment is calibrated with standards traceable to NIST.

Arthur R. Wolfe
Vice President

REPORT - 004
FRP Laminate Analysis
Sample #005
Vessel: S/V Cynthia Woods
Laminate Ply-by-Ply Analysis
(hole saw cutout received)

<table>
<thead>
<tr>
<th>Ply</th>
<th>Material</th>
<th>Approximate Weight</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cloth/Putty</td>
<td>9.1 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>WR/Putty</td>
<td>- oz/yd²</td>
<td>(partial roving present)</td>
</tr>
<tr>
<td>3</td>
<td>CS/Putty</td>
<td>2.2 oz/ft²</td>
<td>(hole is 22 mils deep between 3 &amp; 4)</td>
</tr>
<tr>
<td>4</td>
<td>+/-45 KN BX</td>
<td>12.7 oz/yd²</td>
<td>(blue paint ~1 mil, white gel ~25 mils)</td>
</tr>
<tr>
<td>5</td>
<td>0/90 KN BX</td>
<td>~ 23 oz/yd²</td>
<td>(Glass/Kevlar hybrid, estimated weight)</td>
</tr>
<tr>
<td>6</td>
<td>CS</td>
<td>0.4 oz/ft²</td>
<td>(partial ply)</td>
</tr>
<tr>
<td>7</td>
<td>0/90 KN BX</td>
<td>16.9 oz/yd²</td>
<td>(partial ply)</td>
</tr>
<tr>
<td>8</td>
<td>CS</td>
<td>0.9 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>0/90 KN BX</td>
<td>26.5 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>CS</td>
<td>0.8 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>+/-45 KN BX</td>
<td>12.3 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>CS</td>
<td>0.9 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>+/-45 KN BX</td>
<td>12.5 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>CS</td>
<td>1.0 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>+/-45 KN BX</td>
<td>13.1 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>CS</td>
<td>0.8 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>0/90 KN BX</td>
<td>25.3 oz/yd²</td>
<td>(white gel ~15 mils)</td>
</tr>
<tr>
<td>18</td>
<td>CS</td>
<td>0.8 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>0/90 KN BX</td>
<td>19.9 oz/yd²</td>
<td>(partial ply)</td>
</tr>
<tr>
<td>20</td>
<td>CS</td>
<td>1.8 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>0/90 KN BX</td>
<td>25.1 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>CS</td>
<td>1.5 oz/ft²</td>
<td></td>
</tr>
</tbody>
</table>

Inner Surface
- - - (white gel ~15 mils)

Average Thickness 0.678 in. (sample is delaminated into 3 pieces)

ASTM D 2584
Resin Content 55.2 % by weight
Reinforcement Content 44.8 % by weight

Notes: Values represent the results from 1 test specimen (ASTM D 2584).
CS = chopped strand, KN BX = knitted biaxial, WR = woven roving

I hereby certify that the test results contained in this report are true and accurate
within the limits of the measuring devices employed. All mass and dimensional measuring
devices are calibrated according to ASTM standards. The test equipment
is calibrated with standards traceable to NIST.

Arthur R. Wolfe
Vice President
FRP Laminate Analysis

Sample #006
Vessel: S/V Cynthia Woods
Laminate Ply-by-Ply Analysis (hole saw cutout received)

<table>
<thead>
<tr>
<th>Ply</th>
<th>Material</th>
<th>Approximate Weight</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CS</td>
<td>1.9 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>+/45 KN BX</td>
<td>12.2 oz/yd²</td>
<td>(Glass/Kevlar hybrid, estimated weight)</td>
</tr>
<tr>
<td>3</td>
<td>0/90 KN BX</td>
<td>~ 23 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>CS</td>
<td>1.2 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0/90 KN BX</td>
<td>25.0 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>CS</td>
<td>0.8 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>+/45 KN BX</td>
<td>12.4 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>CS</td>
<td>1.0 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>+/45 KN BX</td>
<td>12.4 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>CS</td>
<td>1.7 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>0/90 KN BX</td>
<td>25.1 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>CS</td>
<td>0.9 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>0/90 KN BX</td>
<td>24.6 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>CS</td>
<td>0.3 oz/ft²</td>
<td>partial ply</td>
</tr>
<tr>
<td>15</td>
<td>0/90 KN BX</td>
<td>- oz/yd²</td>
<td>partial ply</td>
</tr>
<tr>
<td>16</td>
<td>CS</td>
<td>0.4 oz/ft²</td>
<td>partial ply</td>
</tr>
<tr>
<td>17</td>
<td>0/90 KN BX</td>
<td>- oz/yd²</td>
<td>partial ply</td>
</tr>
<tr>
<td>18</td>
<td>CS</td>
<td>2.7 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>0/90 KN BX</td>
<td>25.0 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>CS</td>
<td>1.8 oz/ft²</td>
<td></td>
</tr>
</tbody>
</table>

Inner Surface - - - (white gel/paint ~3 mils)

Average Thickness 0.718 in.

ASTM D 2584
Resin Content 57.2 % by weight
Reinforcement Content 42.8 % by weight

Notes: Values represent the results from 1 test specimen (ASTM D 2584).
CS = chopped strand, KN BX = knitted biaxial, WR = woven roving

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Arthur R. Wolfe
Vice President
FRP Laminate Analysis

Sample #007
Vessel: S/V Cynthia Woods
Laminate Ply-by-Ply Analysis (hole saw cutout received)

<table>
<thead>
<tr>
<th>Ply</th>
<th>Material</th>
<th>Approximate Weight</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outer Surface</td>
<td>-</td>
<td>-</td>
<td>(no coatings)</td>
</tr>
<tr>
<td>1</td>
<td>WR</td>
<td>18.6 oz/yd²</td>
<td>(partial ply)</td>
</tr>
<tr>
<td>2</td>
<td>WR</td>
<td>20.5 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>CS/BX</td>
<td>-</td>
<td>(partial plies, may have been ground down)</td>
</tr>
<tr>
<td>4</td>
<td>0/90 KN BX</td>
<td>16.0 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>CS</td>
<td>0.9 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>0/90 KN BX</td>
<td>15.8 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>CS</td>
<td>0.7 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>0/90 KN BX</td>
<td>22.5 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>CS</td>
<td>0.7 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>0/90 KN BX</td>
<td>25.4 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>CS</td>
<td>0.8 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>0/90 KN BX</td>
<td>23.1 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>CS</td>
<td>1.0 oz/ft²</td>
<td></td>
</tr>
</tbody>
</table>

Inner Surface | - | - | (green foam removed prior to test) |

Average Thickness 0.385 in.

ASTM D 2584
- Resin Content 52.7 % by weight
- Reinforcement Content 47.3 % by weight

Notes: Values represent the results from 1 test specimen (ASTM D 2584).

CS = chopped strand, KN BX = knitted biaxial, WR = woven roving

I hereby certify that the test results contained in this report are true and accurate within the limits of the measuring devices employed. All mass and dimensional measuring devices are calibrated according to ASTM standards. The test equipment is calibrated with standards traceable to NIST.

Arthur R. Wolfe
Vice President
FRP Laminate Analysis

Sample #008
Vessel: S/V Cynthia Woods
Laminate Ply-by-Ply Analysis (hole saw cutout received)

<table>
<thead>
<tr>
<th>Ply</th>
<th>Material</th>
<th>Weight</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0/90 KN BX</td>
<td>20.0 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>CS</td>
<td>1.0 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0/90 KN BX</td>
<td>16.8 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>CS</td>
<td>0.7 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0/90 KN BX</td>
<td>17.9 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>CS</td>
<td>2.2 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>UNI</td>
<td>~38 oz/yd² (appears to be carbon unidirectional)</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>CS</td>
<td>1.4 oz/ft²</td>
<td></td>
</tr>
</tbody>
</table>

Average Thickness 0.439 in.

ASTM D 2584
Resin Content* 68.0 % by weight *(false high value because of carbon burning away)
Reinforcement Content 32.0 % by weight

Notes: Values represent the results from 1 test specimen (ASTM D 2584).
CS = chopped strand, KN BX = knitted biaxial, WR = woven roving

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Arthur R. Wolfe
Vice President
# FRP Laminate Analysis

Sample #009  
Vessel: S/V Cynthia Woods  
Laminate Ply-by-Ply Analysis (hole saw cutout received)

<table>
<thead>
<tr>
<th>Ply</th>
<th>Material</th>
<th>Approximate Weight</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CS</td>
<td>2.0 oz/ft²</td>
<td>(blue paint ~1 mil, white gel ~12 mils)</td>
</tr>
<tr>
<td>2</td>
<td>+/45 KN BX</td>
<td>12.0 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0/90 KN BX</td>
<td>~23 oz/yd²</td>
<td>(Glass/Kevlar hybrid, estimated weight)</td>
</tr>
<tr>
<td>4</td>
<td>0/90 KN BX</td>
<td>- oz/yd²</td>
<td>(Glass/Kevlar hybrid, partial ply)</td>
</tr>
<tr>
<td>5</td>
<td>CS</td>
<td>4.0 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>0/90 KN BX</td>
<td>26.3 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>CS</td>
<td>1.8 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>0/90 KN BX</td>
<td>26.0 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>CS</td>
<td>1.2 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>+/45 KN BX</td>
<td>12.9 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>CS</td>
<td>0.7 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>0/90 KN BX</td>
<td>26.9 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>CS</td>
<td>1.2 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>0/90 KN BX</td>
<td>24.7 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>CS</td>
<td>1.1 oz/ft²</td>
<td></td>
</tr>
</tbody>
</table>

Inner Surface  -  -  -  (white gel/paint ~6 mils)

Average Thickness  0.635 in.

ASTM D 2584  
Resin Content  57.0 % by weight  
Reinforcement Content  43.0 % by weight

Notes: Values represent the results from 1 test specimen (ASTM D 2584).  
CS = chopped strand, KN BX = knitted biaxial, WR = woven roving

I hereby certify that the test results contained in this report are true and accurate  
within the limits of the measuring devices employed. All mass and dimensional measuring  
devices are calibrated according to ASTM standards. The test equipment  
is calibrated with standards traceable to NIST.

Arthur R. Wolfe  
Vice President
### Structural Composites, Inc.

CORPORATE HEADQUARTERS: 7705 Technology Drive, W. Melbourne, FL 32904 USA

Tel: (321)951-9464  Fax: (321)728-9071

Web: www.structuralcomposites.com

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**FRP Laminate Analysis**

Sample #010  
Vessel: S/V Cynthia Woods  
Laminate Ply-by-Ply Analysis  
(hole saw cutout received)

<table>
<thead>
<tr>
<th>Ply</th>
<th>Material</th>
<th>Approximate Weight</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cloth/Putty</td>
<td>6.1 oz/yd&lt;sup&gt;2&lt;/sup&gt;</td>
<td>(blue point ~1 mil, white gel ~16 mils)</td>
</tr>
<tr>
<td>2</td>
<td>WR/Putty</td>
<td>- oz/yd&lt;sup&gt;2&lt;/sup&gt;</td>
<td>(partial roving present)</td>
</tr>
<tr>
<td>3</td>
<td>CS</td>
<td>2.0 oz/ft&lt;sup&gt;2&lt;/sup&gt;</td>
<td>(thin coating between 2 &amp; 3)</td>
</tr>
<tr>
<td>4</td>
<td>+/-45 KN BX</td>
<td>12.6 oz/yd&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0/90 KN BX</td>
<td>~23 oz/yd&lt;sup&gt;2&lt;/sup&gt;</td>
<td>(Glass/Kevlar hybrid, estimated weight)</td>
</tr>
<tr>
<td>6</td>
<td>CS</td>
<td>0.8 oz/ft&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>0/90 KN BX</td>
<td>25.3 oz/yd&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>CS</td>
<td>0.7 oz/ft&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>0/90 KN BX</td>
<td>25.9 oz/yd&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>CS</td>
<td>1.0 oz/ft&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>+/-45 KN BX</td>
<td>11.6 oz/yd&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>CS</td>
<td>1.0 oz/ft&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>+/-45 KN BX</td>
<td>12.6 oz/yd&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>CS</td>
<td>0.9 oz/ft&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>+/-45 KN BX</td>
<td>12.7 oz/yd&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>CS</td>
<td>0.8 oz/ft&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>0/90 KN BX</td>
<td>25.5 oz/yd&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>CS</td>
<td>0.8 oz/ft&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>0/90 KN BX</td>
<td>23.2 oz/yd&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>CS</td>
<td>1.8 oz/ft&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>0/90 KN BX</td>
<td>24.9 oz/yd&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>CS</td>
<td>1.1 oz/ft&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
</tbody>
</table>

### Inner Surface

-  

**Average Thickness**  
0.700 in.  
(sample is delaminated into 3 pieces)

**ASTM D 2584**

- Resin Content: 54.8 % by weight  
- Reinforcement Content: 45.2 % by weight

---

**Notes:**

Values represent the results from 1 test specimen (ASTM D 2584).  
CS = chopped strand, KN BX = knitted biaxial, WR = woven roving

I hereby certify that the test results contained in this report are true and accurate within the limits of the measuring devices employed. All mass and dimensional measuring devices are calibrated according to ASTM standards. The test equipment is calibrated with standards traceable to NIST.

Arthur R. Wolfe  
Vice President

---

REPORT - 010
FRP Laminate Analysis

Sample #011
Vessel: S/V Cynthia Woods
Laminate Ply-by-Ply Analysis (hole saw cutout received)

<table>
<thead>
<tr>
<th>Ply</th>
<th>Material</th>
<th>Approximate Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CS</td>
<td>1.7 oz/ft²</td>
</tr>
<tr>
<td>2</td>
<td>+/45 KN BX</td>
<td>13.0 oz/yd²</td>
</tr>
<tr>
<td>3</td>
<td>0/90 KN BX</td>
<td>~23 oz/yd²</td>
</tr>
<tr>
<td>4</td>
<td>CS</td>
<td>0.8 oz/ft²</td>
</tr>
<tr>
<td>5</td>
<td>0/90 KN BX</td>
<td>25.6 oz/yd²</td>
</tr>
<tr>
<td>6</td>
<td>CS</td>
<td>1.5 oz/ft²</td>
</tr>
<tr>
<td>7</td>
<td>0/90 KN BX</td>
<td>23.7 oz/yd²</td>
</tr>
<tr>
<td>8</td>
<td>CS</td>
<td>0.5 oz/ft²</td>
</tr>
<tr>
<td>9</td>
<td>0/90 KN BX</td>
<td>26.0 oz/yd²</td>
</tr>
<tr>
<td>10</td>
<td>CS</td>
<td>0.9 oz/ft²</td>
</tr>
<tr>
<td>11</td>
<td>+/45 KN BX</td>
<td>12.6 oz/yd²</td>
</tr>
<tr>
<td>12</td>
<td>CS</td>
<td>0.7 oz/ft²</td>
</tr>
<tr>
<td>13</td>
<td>0/90 KN BX</td>
<td>26.0 oz/yd²</td>
</tr>
<tr>
<td>14</td>
<td>CS</td>
<td>0.7 oz/ft²</td>
</tr>
<tr>
<td>15</td>
<td>0/90 KN BX</td>
<td>20.8 oz/yd²</td>
</tr>
</tbody>
</table>

Inner Surface:
- -

Average Thickness: 0.399 in.

ASTM D 2584
- Resin Content: 48.7 % by weight
- Reinforcement Content: 51.3 % by weight

Notes: Values represent the results from 1 test specimen (ASTM D 2584).
CS = chopped strand, KN BX = knitted biaxial, WR = woven roving

I hereby certify that the test results contained in this report are true and accurate within the limits of the measuring devices employed. All mass and dimensional measuring devices are calibrated according to ASTM standards. The test equipment is calibrated with standards traceable to NIST.

Arthur R. Wolfe
Vice President
FRP Laminate Analysis

Sample #012
Vessel: S/V Cynthia Woods
Laminate Ply-by-Ply Analysis (hole saw cutout received)

<table>
<thead>
<tr>
<th>Ply</th>
<th>Material</th>
<th>Weight</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>WR</td>
<td>24.5 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>WR</td>
<td>23.6 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0/90 KN BX</td>
<td>- oz/yd²</td>
<td>(partial, ground down, repair?)</td>
</tr>
<tr>
<td>4</td>
<td>CS</td>
<td>0.4 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0/90 KN BX</td>
<td>15.9 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>CS</td>
<td>0.7 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>0/90 KN BX</td>
<td>18.6 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>CS</td>
<td>0.7 oz/ft²</td>
<td></td>
</tr>
</tbody>
</table>

Inner Surface

Average Thickness

0.230 in.

ASTM D 2584

Resin Content 56.0 % by weight
Reinforcement Content 44.0 % by weight

Notes: Values represent the results from 1 test specimen (ASTM D 2584).
CS = chopped strand, KN BX = knitted biaxial, WR = woven roving

I hereby certify that the test results contained in this report are true and accurate within the limits of the measuring devices employed. All mass and dimensional measuring devices are calibrated according to ASTM standards. The test equipment is calibrated with standards traceable to NIST.

Arthur R. Wolfe
Vice President
FRP Laminate Analysis

Sample #013
Vessel: S/V Cynthia Woods
Laminate Ply-by-Ply Analysis

(hole saw cutout received)

<table>
<thead>
<tr>
<th>Ply</th>
<th>Material</th>
<th>Approximate Weight</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CS</td>
<td>1.9 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>+/-45 KN BX</td>
<td>12.4 oz/yr²</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0/90 KN BX</td>
<td>-23 oz/yr²</td>
<td>(Glas/KeVlar hybrid, estimated weight)</td>
</tr>
<tr>
<td>4</td>
<td>CS</td>
<td>0.8 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0/90 KN BX</td>
<td>25.3 oz/yr²</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>CS</td>
<td>0.8 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>+/-45 KN BX</td>
<td>11.6 oz/yr²</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>CS</td>
<td>0.9 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>+/-45 KN BX</td>
<td>12.3 oz/yr²</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>CS</td>
<td>1.2 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>+/-45 KN BX</td>
<td>12.3 oz/yr²</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>CS</td>
<td>0.9 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>0/90 KN BX</td>
<td>25.2 oz/yr²</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>CS</td>
<td>1.0 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>0/90 KN BX</td>
<td>23.9 oz/yr²</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>CS</td>
<td>0.5 oz/ft²</td>
<td>(partial ply)</td>
</tr>
<tr>
<td>17</td>
<td>0/90 KN BX</td>
<td>- oz/yr²</td>
<td>(partial ply)</td>
</tr>
<tr>
<td>18</td>
<td>CS</td>
<td>- oz/ft²</td>
<td>(partial ply)</td>
</tr>
<tr>
<td>19</td>
<td>0/90 KN BX</td>
<td>- oz/yr²</td>
<td>(partial ply)</td>
</tr>
<tr>
<td>20</td>
<td>CS</td>
<td>- oz/ft²</td>
<td>(partial ply)</td>
</tr>
<tr>
<td>21</td>
<td>0/90 KN BX</td>
<td>- oz/yr²</td>
<td>(partial ply)</td>
</tr>
<tr>
<td>22</td>
<td>CS</td>
<td>1.5 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>0/90 KN BX</td>
<td>24.5 oz/yr²</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>CS</td>
<td>2 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>0/90 KN BX</td>
<td>24.8 oz/yr²</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>CS</td>
<td>1.4 oz/ft²</td>
<td></td>
</tr>
</tbody>
</table>

Inner Surface

Average Thickness 0.745 in.

ASTM D 2584
Resin Content 53.7 % by weight
Reinforcement Content 46.3 % by weight

Notes:
Values represent the results from 1 test specimen (ASTM D 2584).
CS = chopped strand, KN BX = knitted biaxial, WR = woven roving.

I hereby certify that the test results contained in this report are true and accurate
within the limits of the measuring devices employed. All mass and dimensional measuring
devices are calibrated according to ASTM standards. The test equipment
is calibrated with standards traceable to NIST.

Arthur R. Wolfe
Vice President
FRP Laminate Analysis

Sample #026
Vessel: SV Cynthia Woods
Laminate Ply-by-Ply Analysis
(hole saw cutout received)

<table>
<thead>
<tr>
<th>Ply</th>
<th>Material</th>
<th>Weight</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+/-45 KN BX</td>
<td>-</td>
<td>oz/yd²</td>
</tr>
<tr>
<td>2</td>
<td>0/90 KN BX</td>
<td>~ 18</td>
<td>oz/yd²</td>
</tr>
<tr>
<td>3</td>
<td>CS</td>
<td>1.0</td>
<td>oz/ft²</td>
</tr>
<tr>
<td>4</td>
<td>0/90 KN BX</td>
<td>27.2</td>
<td>oz/yd²</td>
</tr>
<tr>
<td>5</td>
<td>CS</td>
<td>1.3</td>
<td>oz/ft²</td>
</tr>
<tr>
<td>6</td>
<td>0/90 KN BX</td>
<td>24.1</td>
<td>oz/yd²</td>
</tr>
<tr>
<td>7</td>
<td>CS</td>
<td>0.6</td>
<td>oz/ft²</td>
</tr>
<tr>
<td>8</td>
<td>0/90 KN BX</td>
<td>25.4</td>
<td>oz/yd²</td>
</tr>
<tr>
<td>9</td>
<td>CS</td>
<td>1.0</td>
<td>oz/ft²</td>
</tr>
<tr>
<td>10</td>
<td>+/-45 KN BX</td>
<td>11.4</td>
<td>oz/yd²</td>
</tr>
<tr>
<td>11</td>
<td>CS</td>
<td>0.9</td>
<td>oz/ft²</td>
</tr>
<tr>
<td>12</td>
<td>+/-45 KN BX</td>
<td>12.8</td>
<td>oz/yd²</td>
</tr>
<tr>
<td>13</td>
<td>CS</td>
<td>0.9</td>
<td>oz/ft²</td>
</tr>
<tr>
<td>14</td>
<td>+/-45 KN BX</td>
<td>12.8</td>
<td>oz/yd²</td>
</tr>
<tr>
<td>15</td>
<td>CS</td>
<td>0.7</td>
<td>oz/ft²</td>
</tr>
<tr>
<td>16</td>
<td>0/90 KN BX</td>
<td>26.2</td>
<td>oz/yd²</td>
</tr>
<tr>
<td>17</td>
<td>CS</td>
<td>0.8</td>
<td>oz/ft²</td>
</tr>
<tr>
<td>18</td>
<td>0/90 KN BX</td>
<td>24.4</td>
<td>oz/yd²</td>
</tr>
<tr>
<td>19</td>
<td>CS</td>
<td>1.7</td>
<td>oz/ft²</td>
</tr>
<tr>
<td>20</td>
<td>0/90 KN BX</td>
<td>28.5</td>
<td>oz/yd²</td>
</tr>
<tr>
<td>21</td>
<td>CS</td>
<td>1.2</td>
<td>oz/ft²</td>
</tr>
</tbody>
</table>

Inner Surface - (gel/flocking/gulpaint exterior surface)

Average Thickness 0.679 in.

ASTM D 2584
Resin Content 55.2 % by weight
Reinforcement Content 44.8 % by weight

Notes: Values represent the results from 1 test specimen (ASTM D 2584).
CS = chopped strand, KN BX = knitted biaxial, WR = woven roving

I hereby certify that the test results contained in this report are true and accurate within the limits of the measuring devices employed. All mass and dimensional measuring devices are calibrated according to ASTM standards. The test equipment is calibrated with standards traceable to NIST.

Arthur R. Wolfe
Vice President

REPORT - 028
FRP Laminate Analysis

Sample #027
Vessel: S/N Cynthia Woods
Laminate Ply-by-Ply Analysis (hole saw cutout received)

<table>
<thead>
<tr>
<th>Ply</th>
<th>Material</th>
<th>Weight</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CS</td>
<td>1.2</td>
<td>oz/ft²</td>
</tr>
<tr>
<td>2</td>
<td>+/-45 KN BX</td>
<td>14.0</td>
<td>oz/yd²</td>
</tr>
<tr>
<td>3</td>
<td>0/90 KN BX</td>
<td>~ 18</td>
<td>oz/yd²</td>
</tr>
<tr>
<td>4</td>
<td>CS</td>
<td>1.0</td>
<td>oz/ft²</td>
</tr>
<tr>
<td>5</td>
<td>0/90 KN BX</td>
<td>27.7</td>
<td>oz/yd²</td>
</tr>
<tr>
<td>6</td>
<td>CS</td>
<td>0.8</td>
<td>oz/ft²</td>
</tr>
<tr>
<td>7</td>
<td>0/90 KN BX</td>
<td>26.7</td>
<td>oz/yd²</td>
</tr>
<tr>
<td>8</td>
<td>CS</td>
<td>0.9</td>
<td>oz/ft²</td>
</tr>
<tr>
<td>9</td>
<td>0/90 KN BX</td>
<td>25.8</td>
<td>oz/yd²</td>
</tr>
<tr>
<td>10</td>
<td>CS</td>
<td>1.0</td>
<td>oz/ft²</td>
</tr>
<tr>
<td>11</td>
<td>+/-45 KN BX</td>
<td>10.3</td>
<td>oz/yd²</td>
</tr>
<tr>
<td>12</td>
<td>CS</td>
<td>0.9</td>
<td>oz/ft²</td>
</tr>
<tr>
<td>13</td>
<td>+/-45 KN BX</td>
<td>12.5</td>
<td>oz/yd²</td>
</tr>
<tr>
<td>14</td>
<td>CS</td>
<td>0.9</td>
<td>oz/ft²</td>
</tr>
<tr>
<td>15</td>
<td>+/-45 KN BX</td>
<td>12.8</td>
<td>oz/yd²</td>
</tr>
<tr>
<td>16</td>
<td>CS</td>
<td>0.7</td>
<td>oz/ft²</td>
</tr>
<tr>
<td>17</td>
<td>0/90 KN BX</td>
<td>25.4</td>
<td>oz/yd²</td>
</tr>
<tr>
<td>18</td>
<td>CS</td>
<td>1.0</td>
<td>oz/ft²</td>
</tr>
<tr>
<td>19</td>
<td>0/90 KN BX</td>
<td>22.3</td>
<td>oz/yd²</td>
</tr>
<tr>
<td>20</td>
<td>CS</td>
<td>1.4</td>
<td>oz/ft²</td>
</tr>
<tr>
<td>21</td>
<td>0/90 KN BX</td>
<td>-</td>
<td>oz/yd² (partial ply)</td>
</tr>
<tr>
<td>22</td>
<td>CS</td>
<td>0.7</td>
<td>oz/ft²</td>
</tr>
<tr>
<td>23</td>
<td>0/90 KN BX</td>
<td>26.2</td>
<td>oz/yd²</td>
</tr>
<tr>
<td>24</td>
<td>CS</td>
<td>1.5</td>
<td>oz/ft²</td>
</tr>
</tbody>
</table>

Inner Surface

Average Thickness 0.687 in.

ASTM D 2564
Resin Content 53.8 % by weight
Reinforcement Content 46.2 % by weight

Notes: Values represent the results from 1 test specimen (ASTM D 2564).
CS = chopped strand, KN BX = knitted bi-axial, WR = woven roving

I hereby certify that the test results contained in this report are true and accurate within the limits of the measuring devices employed. All mass and dimensional measuring devices are calibrated according to ASTM standards. The test equipment is calibrated with standards traceable to NIST.

Arthur R. Wolfe
Vice President
Structural Composites, Inc.
Attn: Arthur Wolfe
7705 Technology Drive
Melbourne, FL 32904

Dear Mr. Wolfe:

The U. S. Coast Guard is investigating the capsizing of the S/V CYNTHIA WOODS. Our investigation includes the collection of core samples from various parts of the vessel's hull, keel, and keel boss for testing and analysis. A complete inventory of these samples along with photos of each sample is attached as enclosure (2). The photos will aid you in the positive identification of each sample as you handle them.

Your laboratory was selected by mutual agreement of the interested parties to serve as the testing laboratory for these samples. The agreed upon testing protocol is found in enclosure (1). Information concerning these samples shall not be discussed with any parties without the express consent of the U. S. Coast Guard.

These samples are U. S. Coast Guard evidence and our investigators have initiated a formal chain of custody for each sample as they were removed from the vessel. The chain of custody is documented on the white portion of each evidence bag. Using permanent marker, please fill in the date you receive the evidence. Upon completion of the testing, return any sample remains and test results to the U. S. Coast Guard at the address listed above. Prior to returning the samples to us, complete the chain of custody section to document the transfer back to us.

Please direct any questions regarding the protocol or release of information surrounding these samples to my staff: Lieutenant Commander Kevin Ivey or Lieutenant Cliff Harder. They can be reached at (409) 978-2704/2705 respectively.

Sincerely,

J. E. ELLIOTT
Commander, U.S. Coast Guard
Commanding Officer

2 Enclosures
ENCLOSURE (1) Core Sample Testing Protocol

TEST PROGRAM BACKGROUND
Please be advised that some of the samples may contain repairs, on both the interior and exterior surfaces. We are interested in information about these repairs, so to the extent practical, please separate and test any such repair layers/materials found. It appears that the original laminates were made with red tinted catalyst.

OBJECTIVE
To reveal through physical analysis:

1. The thickness of the samples both before and after removal of any repairs and removal of the interior and exterior surface coatings (i.e., anti-fouling paint, gelcoat or other barrier coats, and any laminates added outside of the gelcoat). Please measure thickness at four (4) locations around the circumference, using the orientation line at 90° intervals.

2. The fiber to resin ratio by weight.

3. The laminate schedule by material type and nomenclature (i.e. woven, knit, chop, unidirectional, etc.), sequence, and fiber orientation. Please note that the following list indicates the orientation of each sample relative to the vessel’s hull. Please present your ply orientation results relative to our vessel ply orientation indicators. Please present the areal weights in US units.

4. Identify any fiber, resin, or laminate(s) on top of original interior or exterior gelcoat and conduct the aforementioned analyses (#1-3) separately.

BURN TEST (A modified ASTM 2584)
Please conduct the burnout tests on the largest possible portions of each sample coupon.

Prior to the burn testing, please remove all non-structural materials mentioned above, including materials on the inside surface of the coupon. If complete removal of these materials will compromise the integrity of a woven or knit laminate layer, please only remove the coatings until the laminate surface is exposed. Testing with a bit of gelcoat in the crimps or between the rovings is preferable to compromising the determination of the laminate’s areal weight.

LAMINATE SCHEDULE DETERMINATION
Sample coupons are marked by number (See ENCLOSED 2) and a reference line relative to their orientation on the vessel. Please determine the areal weights of the laminates and in what order and orientation they are present in the sample, starting from the exterior.

When presenting the test results please use the same sample identification numbers listed below and present the results in Excel® and Adobe Acrobat® formats.

If, based upon your experience, you feel that the presence of carbon or Kevlar® plies within some of the coupons may compromise the accuracy of the proposed testing, please remove these layers and then test the balance of the samples according to the methods discussed above. Please discuss these considerations in your report and describe how the carbon and Kevlar® layers were tested.

Please do not test the keel to hull mating plate “deadwood” identified by the red XXX marks on the item.
ENCLOSURE (2) Itemized List of Coupons

Total of 16 coupons. Items 1 through 13. Items 25 through 27.

<table>
<thead>
<tr>
<th>Evidence Number</th>
<th>Coupon identification</th>
<th>Coupon Reference Line Orientation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 ft. aft of No. 5 floor, off center to port 1&quot;</td>
<td>Fore and Aft</td>
</tr>
<tr>
<td>2</td>
<td>At No. 4 floor, fwd face centerline.</td>
<td>Athwartships</td>
</tr>
<tr>
<td>Evidence Number</td>
<td>Coupon identification</td>
<td>Coupon Reference Line Orientation</td>
</tr>
<tr>
<td>-----------------</td>
<td>-----------------------------------------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>3</td>
<td>At No. 3 floor, aft face on centerline</td>
<td>Athwartships</td>
</tr>
<tr>
<td>4</td>
<td>Port side at end of No. 5 floor 39&quot; from CL (fracture)</td>
<td>Fore and Aft</td>
</tr>
<tr>
<td>Evidence Number</td>
<td>Coupon Identification</td>
<td>Coupon Reference Line Orientation</td>
</tr>
<tr>
<td>-----------------</td>
<td>-----------------------------------------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>5</td>
<td>On delaminated area to Stbd.</td>
<td>Fore and Aft</td>
</tr>
<tr>
<td>6</td>
<td>Fwd of No. 4 floor 15&quot; off CL. Healthy spot on bottom.</td>
<td>Fore and Aft</td>
</tr>
</tbody>
</table>
**LIST OF COUPONS**

<table>
<thead>
<tr>
<th>Evidence Number</th>
<th>Coupon Identification</th>
<th>Coupon Reference Line Orientation</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Fwd. face of No. 5 floor 3&quot; off center to port.</td>
<td>Athwartships</td>
</tr>
<tr>
<td>8</td>
<td>Top surface of No. 3 floor (check carbon layers)</td>
<td>Fore and Aft</td>
</tr>
<tr>
<td>Evidence Number</td>
<td>Coupon identification</td>
<td>Coupon Reference Line Orientation</td>
</tr>
<tr>
<td>-----------------</td>
<td>-----------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>9</td>
<td>About 12 in. above No. 4 sample</td>
<td>Fore and Aft</td>
</tr>
<tr>
<td>10</td>
<td>3&quot; to port of CL and 4&quot; fwd of No. 5 floor</td>
<td>Fore and Aft</td>
</tr>
<tr>
<td>Evidence Number</td>
<td>Coupon identification</td>
<td>Coupon Reference Line Orientation</td>
</tr>
<tr>
<td>-----------------</td>
<td>----------------------------------------------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>11</td>
<td>Beneath engine on CL 20&quot; fwd. of C-27</td>
<td>Fore and Aft</td>
</tr>
<tr>
<td>12</td>
<td>Aft face, 2&quot; of CL to port frame 4</td>
<td>Athwartships</td>
</tr>
<tr>
<td>Evidence Number</td>
<td>Coupon Identification</td>
<td>Coupon Reference Line Orientation</td>
</tr>
<tr>
<td>-----------------</td>
<td>-----------------------</td>
<td>----------------------------------</td>
</tr>
<tr>
<td>13</td>
<td>Starboard 13&quot;-10&quot; aft on water line and 10&quot; off CL.</td>
<td>Fore and Aft</td>
</tr>
<tr>
<td>25</td>
<td>Starboard side of root of keel about the center</td>
<td>Fore and Aft</td>
</tr>
<tr>
<td>Evidence Number</td>
<td>Coupon Identification</td>
<td>Coupon Reference Line Orientation</td>
</tr>
<tr>
<td>-----------------</td>
<td>------------------------------------------------------------</td>
<td>-----------------------------------</td>
</tr>
<tr>
<td>26</td>
<td>Section 4 of keel laminate including boss</td>
<td>Fore and Aft</td>
</tr>
<tr>
<td>27</td>
<td>Section 2 of keel laminate including boss</td>
<td>Fore and Aft</td>
</tr>
</tbody>
</table>
Appendix No. 5
(AP-5)
Principles of Yacht Design

for the F hull shows roughly the same performance that a traditionally transversely frame-stiffened hull will give. As we have seen previously, the picture changes when dealing with longitudinal loadings. So, to summarize, the hull must be stiffened lengthwise as well as transversely to withstand the rigging and slamming forces. This can be done either by a separate stiffening system, by a monocoque structure or by a combination thereof.

Fig 11.11 shows an example of a calculation for stresses from the ballast keel on the YD-40. The 'design-attitude' for the boat is 90° heeled over and situated totally in air. Regarding the hull as in the air and applying a factor of safety of 4 to 6 takes care of the added loadings from dynamics, which are not incorporated in the formulae.

A simple calculation of moments around the keelbolts gives the transverse keel moment \( M_{k_b} \), and by dividing this moment with the distance between the windward keelbolts and leeward keel-edge \( OF_{b_0} \) the keelbolt load \( P_{b_0} \) can be calculated (81156 N in our case).

The \( OF_{b_0} \) typically varies along the root chord of the keel, and to account for this it is reasonable to take a mean value of all \( OF_{b_0} \)'s. Assuming the keel to have six pairs \( m_{kb} \) of keelbolts, the loading on each bolt becomes \( P_{kb} = P_{b_0}/m_{kb} \) 13526 N. When calculating the required dimensions of the keelbolts it is the yield strength \( \sigma_y \) of the material that shall be used, not the ultimate strength. The required diameter of the keelbolts \( d_{kb} \), when using a safety factor of 5, becomes 21 mm, as can be seen from the formulae in Fig 11.11.

The yield strength used in the example above is 206 N/mm² which corresponds to stainless steel AISI-316. The diameter obtained is the minimum core diameter of the bolt, so the nominal bolt size will be a M26-bolt in the metric system or a 1 in bolt in the imperial system.

On the leeward side of the keel the tension in the keelbolts must be absorbed as a compression by the mating areas of the keel and hull. Since only the area nearest to the leeward edge is effective, it is reasonable to assume that 25% of the total area must be able to withstand a pressure corresponding to the total load on the bolts. The minimum required keel/hull area \( A_{mm} \) is 13873 mm².

A typical ultimate strength in compression for a glassfibre laminate is 117 N/mm² in compression. The actual keel has a 25% area of approximately 150 000 mm², so the factor of safety is considerable in this case.

Each pair of keelbolts is connected to a floor which has to absorb the moment induced by the tension in the windward keelbolt. The factor of safety for the floors is taken to be the same as for the keelbolts; in our example the factor is 5. So the bending moment working on each floor becomes the total transverse keel moment \( M_{k_b} \) divided by the number of floors, six in our example, which gives a bending moment \( M_{b} \) of 18598 N m.

The required section modulus \( SM_{b} \) to withstand this moment is calculated by dividing the floor bending moment \( M_{b} \) by the floor laminate's ultimate strength in tension, typically 125 N/mm² for a glassfibre laminate, and in this case it becomes 150 cm³. The result
Hull Construction

Fig 11.11 Loadings from the keel

Transverse Keel Moment \( (M_k) \):
\[
M_k = CG_{bk} \cdot W_{ball} \cdot g \quad [22319 \text{ Nm}]
\]

Total Keelbolt Load \( (P_k) \):
\[
P_k = \frac{M_k}{OF_{bolts}} \quad [81156 \text{ N}]
\]

Required Keelbolt Diameter \( (d_{kb}) \):
\[
d_{kb} = 2 \cdot \sqrt{\frac{P_k \cdot OF_{bolts}}{\gamma_p \cdot \sigma_y \cdot \pi}} \quad [21 \text{ mm}]
\]

Minimum Keel/Hull-Area \( (A_{min}) \):
\[
A_{min} = \frac{P_k \cdot \gamma_p \cdot \sigma_{ut}}{0.25 \cdot \sigma_y \cdot \pi} \quad [13873 \text{ mm}^2]
\]

Required Section Modulus for Floors \( (SM_f) \):
\[
SM_f = \frac{M_f}{\sigma_{ut}} \quad [130 \text{ cm}^3]
\]

Keelbolt Tension \( (P_{kb}) \):
\[
P_{kb} = \frac{P_k}{\gamma_{kb}} \quad [13526 \text{ N}]
\]

\( \gamma_{kb} \) = factor of safety: 4–6 \[6\]

\( \sigma_y \) = yield strength for keelbolts \(206 \text{ N/mm}^2\) for AISI-316

Floor Bending Moment \( (M_f) \):
\[
M_f = \frac{W_f \cdot \gamma_p \cdot \sigma_{ut}}{\gamma_f} \quad [18598 \text{ Nm}]
\]

\( \gamma_f \) = number of floors over keel \[6\]

\( \sigma_{ut} \) = typical ultimate strength in compression for GRP \(117 \text{ N/mm}^2\)

\( \sigma_{ut} \) = typical ultimate strength in tension for GRP \(125 \text{ N/mm}^2\)
comes out in cm³ when using Nm for the moment and N/mm² for the strength value.

Entering the diagram of Fig 11.11 with an SM-value of 1.50 cm³ and choosing a floor height (H) of 12 cm we need a flange area of 9 cm² and a thickness of 1.2 cm. So the minimum floor breadth is (9/1.2) 7.5 cm. If the keelbolts are passing through the floor, we must add their diameters to the breadth of the floor to achieve sufficient flange area, i.e. total breadth becomes 10 cm. These values are relevant for the floor section at the centreline; at the ends the required section modulus can be taken as half of that at the centreline. 75 cm³ for our boat. This leads to a section of 7.5 cm height, keeping the laminate thickness, breadth and flange area the same as at the centreline.

**Forces from grounding**

It is not practical to calculate the impact force \( F_i \) exactly. It depends on the weight and speed of the vessel, as well as the shape of the seabed or rock (which governs the time of retardation) and the shape of the boat (which has great importance regarding the damping of the movement). For now it is sufficient to make some simplifications on the conservative side in order to guarantee the strength, since a slight increase of weight in this area seldom poses any substantial problems.

From Fig 11.12 it can be seen that the impact force \( F_i \) gives a moment in the keel/hull area (\( M_{kg} \)) of 200240 Nm. In order to arrive at this figure and to solve the equations of Fig 11.12, some assumptions have to be made. We assume the boat’s speed to be 8 knots, \( V_s = 4.11 \) m/s, and that the time to a full stop (\( t_s \)) is 0.25 seconds. This equals a ‘stopping-distance’ of approximately half a metre (which is rather a sudden stop) and gives a retardation of \( a_s = V_s / t_s \) (\( = 16.44 \) m/s²).

Since the displacement of the vessel is 8120 kg this gives an impact force \( F_i = \text{Displ} \cdot a_s \), 133493 N). Now it is easy to calculate the impact moment, \( M_{kg} \), from the formula in the figure, and from this the resultant force \( P_r \), 125150 N, can be calculated by dividing the impact moment by the length of the keel. This force acts as a pressure on the aft part of the keel, and as tension on the forward part. As can be clearly seen from these equations, a short and/or deep keel gives much higher loadings on the hull when running aground.

The centre of rotation for the keel is very uncertain and depends on the stiffness of different parts of the keel/hull joint as well as the slope and/or the geometry of the joint. Since the keelbolts and the material in the joint are more deformed the further you get from the rotational centre, it is probable that only the most forward bolts are fully tensioned, and that the joint area is subjected to maximum pressure only in its aft part.

A reasonable way to calculate the required tensile strength (\( \sigma_{st} \)) for the most forward bolts, is to assume that the number of bolts situated within the forward 25% of the keel (\( n_{st,25} \)) take care of the forces from the grounding (\( P_r \)). In the YD-40 we have two bolts in the actual area, so the required tensile strength becomes 181 N/mm², as can be seen from the formula in Fig 11.12. Since the yield strength for AISI-316 stainless steel is 206 N/mm² it is obvious that there is no risk of tearing
Hull Construction

Impact Force \( (P_i) \):
\[ P_i = b \cdot a_i \quad [135493 \, \text{N}] \]
\( a_i = V_a / L \); retardation \( [16.44 \, \text{m/s}^2] \)
\( V_a = \text{boattaped} \quad [8 \, \text{knots}] \)
\( V_s = 0.514 \cdot V_a \); speed \( [4.11 \, \text{m/s}] \)
\( t_s = \text{time to full stop} \quad [0.25 \, \text{s}] \)

Impact Moment \( (M_{bi}) \):
\[ M_{bi} = P_i \cdot D \quad [200240 \, \text{Nm}] \]

Reaction Force \( (P_r) \):
\[ P_r = \frac{M_{bi}}{K_r} \quad [125150 \, \text{N}] \]

Required Tensile Strength for Keelbolts In the 25\% Forward Keel Area \( (a_{25}) \)
\[ a_{25} = \frac{P_r}{A_{25}} \quad [181 \, \text{N/mm}^2] \]

\( A_{25} = \text{Number of Bolts in the 25\% Area} \)
\( A_0 = \text{Cross Sectional Bolt Area} \)

Floor Bending Moment \( (M_f) \):
\[ M_f = \frac{P_r \cdot L_f}{4} \quad [93863 \, \text{Nm}] \]

Required Floor Section Modulus \( (S_{mf}) \):
\[ S_{mf} = \frac{M_f}{W} \quad [750 \, \text{cm}^3] \]

Fig. 11.12 Loadings from grounding.
the keelbolts apart by running aground with this boat. The most sensitive area is the aft part, where the keel meets the hull.

The maximum thrust from the grounding is \( P_t \) and occurs at the trailing edge of the keel. This force gives a bending moment in the floor supporting the aft part of the fin \( M_{44} \) of 93863 Nm, and is calculated by multiplying the thrust by one quarter of \( L_t \), where \( L_t \) is the length of the floor supporting the keel as illustrated in Fig 11.12.

This bending moment requires a section modulus, \( SM_{44} \), of the floor of 750 cm³. Entering the diagram in Fig 11.12 with this section modulus we read off a laminate thickness of 2 cm with the chosen floor height, \( H \), of 22 cm. The minimum flange area is 25.4 cm² which leads to a floor width of 12.7 cm. One problem in real life with a shallow hull, is the lack of space between the sole and the bottom of the canoe body. It may not be possible to fit a floor of this height, and in that case we must use multiple floors in this area and divide the grounding force between them. By using two floors we can let the height remain 12 cm, as on the rest of them, resulting in a laminate thickness of 2.05 cm and a flange area of 26 cm² giving a floor width of 12.7 cm.

The rudder forces are developed when the rudder is producing a side force, i.e. when you are (a) turning the boat or (b) trying to counteract a turning moment. In the first case it is not necessary that the maximum force is developed, since the boat gives way for the side force by actually turning. In the second case it is more likely that maximum forces will develop. A typical case is when trying to counteract a broach when spinnaker reaching.

Fig 11.13 shows a typical spade rudder with values from the YD-40. In the following simplified calculations we have used double the geometric aspect ratio, the effective aspect ratio (\( AR_r \)), which means that we do not take any ventilation into account and that the rudder is close to the boat bottom. This is hardly ever the case in reality, but it gives us an extra safety factor, because the forces are exaggerated this way.

The centre of effort for the rudder profile (NACA 0012) lies 25% aft of the leading edge \( (0.25l_u = 16.8 \text{ cm} \& 0.25l_l = 8 \text{ cm}) \). Vertically, the position can be calculated as indicated in Fig 11.13. By deducting the short parts (D1 & D2) from the full-length diagonals and triangulating the remaining parts (showed as dashed lines) we can accurately position the geometric centre of effort, but here we only use the vertical distance, \( R_{c_x} \). Normally this figure will be in the region of 45% of the total height. Knowing the CE position and the 25% line, the distance from the leading edge to the CE can be calculated easily. Also, knowing the position of the rudder shaft (the corresponding distance (leading edge to CE, \( X_u = 12.5 \text{ cm} \& X_l = 2 \text{ cm} \)) is easily determined. The difference between these figures gives the turning lever, \( l_c = 5 \text{ cm} \) in our example.

The effective aspect ratio, \( AR_r \), is double the ratio between the average height and the average length of the rudder (6.2 for the YD-40). The lateral area \( A_{44} \) of the rudder is obviously the average height times the average length, 0.765 m². These values are used to
Appendix No. 6
(AP-6)
References used for structural calculation standards

American Bureau of Shipping (ABS) Reinforced Plastic Structures-1978
Elements of Boat Strength, Dave Gerr
Fiberglass Boat Design and Construction, Robert Scott, Second Edition

References used for material physical properties

American Bureau of Shipping (ABS) Reinforced Plastic Structures-1978
Owens Corning Knytex Reinforcements
Vectorply KE-LT2300 Product Bulletin
Reichold Hydrex Product Bulletin
Appendix No. 7
(AP-7)
ANCON MARINE CONSULTANTS, INC.
MARINE ENGINEERS
ST. JAMES CITY, FLORIDA

THE CYNTHIA WOODS INVESTIGATION

OTHER ASSORTED DOCUMENTS

USED FOR THE INVESTIGATIONS

APPENDIX No. 7
INSPECTION AND TEST PROTOCOLS FOR
TEXAS A&M SAILBOAT ACCIDENT

A. ASSUMPTIONS:

This protocol is based on the assumption that the sailboat in question and the recovered keel structure are available for both non-destructive and limited destructive testing. In addition, this protocol is based on the assumption that the sister of the sailboat in question is a near exact replica and is available for inspection and testing, including the potential for on-water instrumented testing of stresses. Finally, this protocol is based on the assumption that documentation is readily available that shows design, development, manufacture, test, usage, support, training and management history.

B. INSPECTION BASELINE:

This inspection has three different aspects. First is an examination of the hull structure and materials of the sailboat in question. Second is the examination of the remnants of the recovered keel. Third is an examination of the sister sailboat with specific attention paid to the hull and keel interface. All of these examinations involve taking measurements and photographs to preserve a record of these measurements and examinations findings.

1. **Examination of the hull structure and materials:** This part of the examination involves a non-destructive visual and instrumentation inspection. Additionally destructive examination in a material lab of samples taken from the hull and keel (Interested parties will agree on laboratory and cost sharing). Examination of bonding and repair agents and testing in a material lab.

   Instrumentation will be used to find voids and delaminations and determine the size and extent of the voids and delaminations.

2. **Examination of the recovered keel:** This part of the examination involves a non-destructive visual, instrumentation inspection and materials testing.¹

3. **Examination of the sister sailboat:** This part of the examination involves a non-destructive visual and instrumentation inspection. Tapping on the hull and otherwise checking for differences in hull sounds (void/delamination) or probing for material weakness should be done. This examination also involves the potential for limited destructive inspection upon agreement of all interested parties in the event that cracks, including voids and delaminations, and hull to keel attachment. If corrosion is seen in the keel bolts or backing plate, these items may have to be removed to determine the materials used.

C. DATA TAKING KEYS/EQUIPMENT:

¹ Removal of the hull sample from underneath the steel plates. Preservation of steel plates and bolts.
The inspections are static in nature. Sampling will be necessary and should be done on both the accident sailboat and the sister boat.

1. Visual - magnifying glass and loop, small hammer, depth gauge;

2. Visual - tape measures, cameras;

3. Portable - hand scanner to find voids and delaminations;

4. Portable - moisture meter;

5. On-site - x-ray of hull and keel to determine failure patterns;

6. Laboratory - stress and strain measurements associated with the structure and potential failure mechanisms;

7. Laboratory - microscopic examination of cracks, voids and delaminations; and

8. Laboratory - material determination. Examination to distinguish repairs from original manufacture.

Primary for operational test: The tests are dynamic in nature. The number of test runs performed will vary based on findings underway.

1. Stress/strain monitoring devices;

2. Photography and videography focused on keel and associated hull structure; and

3. Laboratory - mock up for stress/strain test (option).
Appendix No. 8
(AP-8)
APPENDIX 8

HULL THICKNESS DISCUSSION
Hull thickness checks were made against existing standards. The purpose of the exercise was to determine if deficiencies exist in the laminate design that may have been a contributing factor in the keel attachment loss. These calculations are independent of the keel structure determinations (reference Appendix 1 in the body of the report). The calculations for skin thicknesses are independent of the keel structure.

The reference standard is the ABS Guide to Classify Offshore Racing Yachts-1994 (ABS ORY) per appendix 6. The standard requires the design to meet certain minimum thicknesses for the hull. In the case of the Cynthia Woods, the hull construction is a “single skin” (there is no core material). The standard dictates that the hull skin be broken into discreet laminate zones for purposes of calculation. The standard provides calculation methods for determining minimum hull thicknesses in various parts of the hull. The standard also provides for corrections factors for panel aspect ratio and hull curvature. There exist three categories in the standard for thickness determination as follows:

1) Required hull thickness based on the Flexural Strength of the material(s) used in the construction of the skin.
2) Required hull thickness based on the Flexural Strength in Fatigue of the material(s) used in the construction of the skin.
3) Required hull thickness for stiffness based on the Flexural Modulus (Ef) of the material(s) used in the construction of the skin.

The hull thickness calculations for the Cynthia Woods were checked over 5 discreet panels or laminate zones. MVD assumed a Flexural Strength of 25000psi and a Flexural Modulus of 1.1 x 10^6. Reference the ABS Standard in Appendix 6. These are the properties of a low technology mat/woven roving/polyester resin laminate. In fact, the vessel was constructed of a higher strength laminate with Flexural Strength of 32000psi and a Flexural Modulus of 1.7 x 10^6. This is a very conservative estimate as the laminate was composed of materials of differing values. Reference Marine Composites in Appendix 6.

SUMMARY OF FINDINGS: As mentioned in 1) below, most of the panels, as designed do comply with ABS criteria, but some fail (by small amounts) when you consider the minimum thickness, since the panel varies due to overlapping of reinforcement materials. On the other hand, when looking at the panels, as built, all panels comply with the ABS criteria. This is due to the use of materials with higher physical properties when building the boat.

1) Analysis Results-Thickness based on Flexural Strength

As Designed-all panels pass the standard based on maximum thickness.
As Built-all panels pass the standard based on minimum thickness and core samples where applicable

2) Analysis Results-Thickness based on Flexural Strength with Fatigue

As Designed-all panels pass the standard based on maximum thickness.
As Built-all panels pass the standard based on minimum thickness and core samples where applicable

3) Analysis Results-Thickness based on Flexural Modulus

As Designed-all panels pass the standard based on maximum thickness.
As Built-all panels pass the standard based on minimum thickness and core samples where applicable.
Cape Fear 38
Laminate Thickness on Centerline

<table>
<thead>
<tr>
<th>Layer Description</th>
<th>Thickness Dry</th>
<th>Thickness Laminated (open mold)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4 oz mat</td>
<td>0.020</td>
<td>0.024</td>
</tr>
<tr>
<td>XM1208</td>
<td>0.036</td>
<td>0.039</td>
</tr>
<tr>
<td>KE-LT-2300</td>
<td>0.036</td>
<td>0.039</td>
</tr>
<tr>
<td>CM2408</td>
<td>0.050</td>
<td>0.054</td>
</tr>
<tr>
<td>CM2408</td>
<td>0.050</td>
<td>0.054</td>
</tr>
<tr>
<td>Total Overlapped Laminate (sum of thicknesses x 2)</td>
<td>0.484</td>
<td>0.528</td>
</tr>
<tr>
<td>Additional CM2408 on centerline</td>
<td>0.05</td>
<td>0.054</td>
</tr>
<tr>
<td>Total Structural Laminate</td>
<td>0.534</td>
<td>0.582</td>
</tr>
<tr>
<td>Gelcoat</td>
<td>0.018</td>
<td>0.018</td>
</tr>
<tr>
<td>Total Thickness</td>
<td>0.552</td>
<td>0.600</td>
</tr>
</tbody>
</table>

Bottom Thickness (outside of overlapped area)

<table>
<thead>
<tr>
<th>Layer Description</th>
<th>Thickness Dry</th>
<th>Thickness Laminated (open mold)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4 oz mat</td>
<td>0.020</td>
<td>0.024</td>
</tr>
<tr>
<td>XM1208</td>
<td>0.036</td>
<td>0.039</td>
</tr>
<tr>
<td>KE-LT-2300</td>
<td>0.036</td>
<td>0.039</td>
</tr>
<tr>
<td>CM2408</td>
<td>0.050</td>
<td>0.054</td>
</tr>
<tr>
<td>CM2408</td>
<td>0.050</td>
<td>0.054</td>
</tr>
<tr>
<td>Total Laminate Structural (sum of thicknesses)</td>
<td>0.242</td>
<td>0.264</td>
</tr>
<tr>
<td>Gelcoat</td>
<td>0.018</td>
<td>0.018</td>
</tr>
<tr>
<td>Total Thickness</td>
<td>0.260</td>
<td>0.282</td>
</tr>
</tbody>
</table>

Bottom Thickness (outside of overlapped area but including CM2408 x 50" on CL)

<table>
<thead>
<tr>
<th>Layer Description</th>
<th>Thickness Dry</th>
<th>Thickness Laminated (open mold)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4 oz mat</td>
<td>0.020</td>
<td>0.024</td>
</tr>
<tr>
<td>Material</td>
<td>Thickness 1</td>
<td>Thickness 2</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------</td>
<td>-------------</td>
</tr>
<tr>
<td>XM1208</td>
<td>0.036</td>
<td>0.039</td>
</tr>
<tr>
<td>KE-LT-2300</td>
<td>0.036</td>
<td>0.039</td>
</tr>
<tr>
<td>CM2408</td>
<td>0.050</td>
<td>0.054</td>
</tr>
<tr>
<td>CM2408</td>
<td>0.050</td>
<td>0.054</td>
</tr>
<tr>
<td>CM2408</td>
<td>0.050</td>
<td>0.054</td>
</tr>
<tr>
<td>CM2408</td>
<td>0.050</td>
<td>0.054</td>
</tr>
</tbody>
</table>

**Total Laminate Structural**

(sum of thicknesses)

<table>
<thead>
<tr>
<th></th>
<th>Thickness 1</th>
<th>Thickness 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.282</td>
<td>0.318</td>
</tr>
</tbody>
</table>

**Gelcoat**

<table>
<thead>
<tr>
<th></th>
<th>Thickness 1</th>
<th>Thickness 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.018</td>
<td>0.018</td>
</tr>
</tbody>
</table>

**Total Thickness**

<table>
<thead>
<tr>
<th></th>
<th>Thickness 1</th>
<th>Thickness 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>0.310</strong></td>
<td><strong>0.336</strong></td>
</tr>
</tbody>
</table>
Thickness Correction Calculation

**Table One**

Thickness requirements are based on the actual laminate used (neglecting the kevlar ply). Actual laminate thickness from core samples shown where applicable.

<table>
<thead>
<tr>
<th>LAM ZONE</th>
<th>s</th>
<th>k</th>
<th>F</th>
<th>p (derived)</th>
<th>t (derived)</th>
<th>t per lam</th>
<th>t per core</th>
<th>t per core</th>
<th>core location per append. 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>14</td>
<td>0.5</td>
<td>0.89</td>
<td>4.386</td>
<td>0.16</td>
<td>.65-36</td>
<td>0.66</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>12</td>
<td>0.5</td>
<td>0.85</td>
<td>4.682</td>
<td>0.15</td>
<td>.65-36</td>
<td>N/A</td>
<td>no sample</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>12</td>
<td>0.5</td>
<td>0.85</td>
<td>4.682</td>
<td>0.15</td>
<td>.65-36</td>
<td>0.700</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>14</td>
<td>0.5</td>
<td>0.89</td>
<td>4.386</td>
<td>0.16</td>
<td>.65-36</td>
<td>0.682</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>16</td>
<td>0.5</td>
<td>0.80</td>
<td>3.942</td>
<td>0.20</td>
<td>.58-32</td>
<td>0.556</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

p<.44Fh
F is from table 7.4

\[ t (\text{strength}) = \sqrt{\frac{p(k1)}{\text{Str Allow}}} \]

**Table Two**

This table calculates the required single skin thickness using Flexural Fatigue Strength for the laminate used. MYD used a Flexural Fatigue Strength of 25000 psi (figure is for conventional mat/woven roving/polyester).

<table>
<thead>
<tr>
<th>LAM ZONE</th>
<th>s</th>
<th>k</th>
<th>F</th>
<th>p (derived)</th>
<th>t (derived)</th>
<th>t per lam</th>
<th>t per core</th>
<th>core location per append. 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>14</td>
<td>0.5</td>
<td>0.89</td>
<td>4.386</td>
<td>0.23</td>
<td>.65-36</td>
<td>0.68</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>12</td>
<td>0.5</td>
<td>0.85</td>
<td>4.682</td>
<td>0.21</td>
<td>.65-36</td>
<td>N/A</td>
<td>no sample</td>
</tr>
<tr>
<td>4</td>
<td>12</td>
<td>0.5</td>
<td>0.85</td>
<td>4.682</td>
<td>0.21</td>
<td>.65-36</td>
<td>0.700</td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td>14</td>
<td>0.5</td>
<td>0.89</td>
<td>4.386</td>
<td>0.23</td>
<td>.65-36</td>
<td>0.682</td>
<td>10</td>
</tr>
<tr>
<td>6</td>
<td>16</td>
<td>0.5</td>
<td>0.80</td>
<td>3.942</td>
<td>0.26</td>
<td>.58-32</td>
<td>0.556</td>
<td>1</td>
</tr>
</tbody>
</table>

p<.44Fh
F is from table 7.4

\[ t (\text{fatigue}) = \sqrt{\frac{p(k1)}{\text{Str fatigue}}} \]

**Table Three**

This table calculates the required single skin thickness using Flexural Modulus for the laminate used. MYD used a Flexural Modulus of 1.1 x 10^6 (figure is for conventional mat/woven roving/polyester).

<table>
<thead>
<tr>
<th>LAM ZONE</th>
<th>s</th>
<th>k1</th>
<th>F</th>
<th>p (derived)</th>
<th>t (derived)</th>
<th>t per lam</th>
<th>t per core</th>
<th>core location per append. 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>14</td>
<td>0.028</td>
<td>0.89</td>
<td>4.386</td>
<td>0.16</td>
<td>.65-36</td>
<td>0.68</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>12</td>
<td>0.028</td>
<td>0.95</td>
<td>4.682</td>
<td>0.14</td>
<td>.65-36</td>
<td>N/A</td>
<td>no sample</td>
</tr>
<tr>
<td>4</td>
<td>12</td>
<td>0.028</td>
<td>0.95</td>
<td>4.682</td>
<td>0.14</td>
<td>.65-36</td>
<td>0.700</td>
<td>6</td>
</tr>
<tr>
<td>5</td>
<td>14</td>
<td>0.028</td>
<td>0.89</td>
<td>4.386</td>
<td>0.16</td>
<td>.65-36</td>
<td>0.682</td>
<td>10</td>
</tr>
<tr>
<td>6</td>
<td>16</td>
<td>0.028</td>
<td>0.80</td>
<td>3.942</td>
<td>0.20</td>
<td>.58-32</td>
<td>0.556</td>
<td>1</td>
</tr>
</tbody>
</table>

p<.44Fh
F is from table 7.4

\[ t (\text{stiffness}) = \frac{0.75e}{(p(k1)(0.028)^{0.333})} \]
Addendum 8

Table of Laminate Thickness Based on Construction Drawing and ABS Guidelines

<table>
<thead>
<tr>
<th>LAM ZONE</th>
<th>t(strength) PER ABS-MYD NUMBERS</th>
<th>t(str fatigue) PER ABS-MYD NUMBERS</th>
<th>t(stiffness) PER ABS-MYD NUMBERS</th>
<th>THICKNESS PER LAM. SCHED</th>
<th>ADDTL LAMINATE</th>
<th>TOTAL THICKNESS</th>
<th>s</th>
<th>TOTAL THICKNESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>0.31</td>
<td>0.33</td>
<td>0.2</td>
<td>.58-.32</td>
<td>.072-.036</td>
<td>.65-.36</td>
<td>14</td>
<td>0.65</td>
</tr>
<tr>
<td>3</td>
<td>0.28</td>
<td>0.39</td>
<td>0.23</td>
<td>.58-.32</td>
<td>.072-.036</td>
<td>.65-.36</td>
<td>12</td>
<td>0.65</td>
</tr>
<tr>
<td>4</td>
<td>0.28</td>
<td>0.39</td>
<td>0.23</td>
<td>.58-.32</td>
<td>.072-.036</td>
<td>.65-.36</td>
<td>12</td>
<td>0.65</td>
</tr>
<tr>
<td>5</td>
<td>0.31</td>
<td>0.44</td>
<td>0.26</td>
<td>.58-.32</td>
<td>.072-.036</td>
<td>.65-.36</td>
<td>14</td>
<td>0.65</td>
</tr>
<tr>
<td>6</td>
<td>0.38</td>
<td>0.36</td>
<td>0.2</td>
<td>.58-.32</td>
<td>.58-.32</td>
<td>.58-.32</td>
<td>18</td>
<td>0.65</td>
</tr>
</tbody>
</table>

Reference: ABS guide for Offshore Racing Yachts 1994

Calculation Parameters: minimum "t" requirements are based on a mat-roving-polyester laminate with the following physical properties

Flexural Strength: 25000psi
Flexural Modulus: 1.1 x 10^6

0.58" Theoretical Centerline Laminate Thickness from Laminate Schedule
0.32" Theoretical Laminate Thickness from Laminate Schedule
Guide for Building and Classing
Offshore Racing Yachts

1994

American Bureau of Shipping
Incorporated by Act of the Legislature of
and State of New York 1862

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American Bureau of Shipping
Two World Trade Center
106th Floor
New York, N.Y. 10048, U.S.A.
SECTION 1

Scope and Conditions of Classification

1.1 Classification

1.1.1 Process
The Classification process consists of a) the development of Rules, Guides, standards and other criteria for the design and construction of marine vessels and structures, for materials, equipment and machinery, b) the review of design and survey during and after construction to verify compliance with such Rules, Guides, standards or other criteria and c) the assignment and registration of class when such compliance has been verified.

The Rules and standards are developed by Bureau staff and passed upon by committees made up of naval architects, marine engineers, shipbuilders, engine builders, steel makers and by other technical, operating and scientific personnel associated with the worldwide maritime industry. Theoretical research and development, established engineering disciplines, as well as satisfactory service experience are utilized in their development and promulgation. The Bureau and its committees can act only upon such theoretical and practical considerations in developing Rules and standards.

1.1.2 Certificates and Reports
Surveys during and after construction are conducted by the Bureau to verify to itself and its committees that, in this case for yachts, the structure and material are in compliance with this Guide and other Rules and standards as far as indicated to the satisfaction of the attending Surveyor. All reports and certificates are issued solely for the use of the Bureau, its committees, its clients and other authorized entities.

1.1.3 Representations as to Classification
Classification of an offshore racing yacht is a representation by the Bureau as to the fitness of the yacht with respect to those aspects covered by this Guide. The Rules, Guides, standards and other criteria of the American Bureau of Shipping are not meant as a substitute for the independent judgement of professional designers, naval architects, owners, operators, masters and crew nor as a substitute for the quality control procedures of yacht builders, steel or aluminum makers, suppliers, manufacturers and sellers of marine vessels, materials and equipment.

The Bureau represents solely to the yacht Owner or clients of the Bureau that when assigning and maintaining the class it will use due diligence in the development of Rules, Guides, standards and other criteria, and in using standards, procedures and techniques as called for by this Guide.

The Bureau further represents to the yacht Owner or other client of the Bureau that its certificates and reports evidence compliance only with one or more of the Rules, Guides, standards or other criteria of the Bureau in accordance with the terms of such certificates or reports.

Under no circumstances whatsoever are these representations to be deemed to relate to any third party.

1.1.4 Scope of Classification
Nothing contained in any certificate or report is to be deemed to relieve any designer, builder, Owner, manufacturer, seller, supplier, repairer, operator, other entity or person of any warranty express or implied. Any certificate or report evidences compliance only with one or more of the Rules, Guides, standards or other criteria of American Bureau of Shipping and is issued solely for the use of the Bureau, its committees, its clients or other authorized entities. Nothing contained in any certificate, report, plan or document review or approval is to be deemed to be in any way a representation or statement beyond those contained in 1.1.3. The validity, applicability and interpretation of any certificate, report, plan or document review or approval are governed by the Rules, Guides and standards of the American Bureau of Shipping who shall remain the sole judge thereof. The Bureau is not responsible for the consequences arising from the use by other parties of the Rules, Guides, standards or other criteria of the American Bureau of Shipping, without review, plan approval and survey by the Bureau.

The term "approved" shall be interpreted to mean that the plans, reports or documents have been reviewed for compliance with one or more of the Rules, Guides, standards, or other criteria of the Bureau.

1.1.5 Suspension of Representation as to Classification
In the event of any damage or casualty to hull or equipment which affects or may affect classification, or the structural integrity, quality or fitness for a particular use or service of a yacht structure or item of material, all representations as to classification are to be considered suspended unless notification of such damage or casualty is given at first opportunity and survey and repairs are thereafter undertaken as required in Section 1.1 of this Guide. Any use, operation or other application of any yacht structure or material for which it has not been approved and which affects or may affect classification or the structural integrity, quality or fitness for a particular use or service is to cause all representations as to classification to be suspended until such time as the condition shall be remedied.

SECTION 1 | 1 Scope and Conditions of Classification
SECTION 7

Plating

7.1 Aluminum, Steel, and Cold-molded Wood Laminate

In general, the structural arrangement for aluminum and steel hulls is to be as given in 8.1.1 and for cold-molded wood as given in 8.3.1. The thickness of the shell, deck and bulkhead plating is to be not less than given by the following equation,

\[ t = sc \frac{\sqrt{F}}{\sigma_s} \text{ mm (in)} \]

where
- \( s \) = the spacing, in mm or in., of the shell longitudinal, deck longitudinal, transverse frame, deck beam or bulkhead stiffener or other supporting member; where the plating is curved it is the chord length distance between the two supporting members.
- \( F \) = the design head, in m or ft., given in Table 7.1
- \( F_{h} \) = the design head reduction factor given in Table 7.4 for shell plating and in Table 7.5 for deck plating, \( F \) is in general not to be taken as less than \( D \) (see 2.5) for the bottom shell, nor less than 0.8D for the side shell plating
- \( k \) = the coefficient varying with plate panel aspect ratio given in Table 7.3 but, unless specially approved otherwise, not to be taken as less than 0.5 for cold-molded wood laminate
- \( \sigma_s \) = the design stress, in N/mm² (kgf/mm², psi) as given in Table 7.2.
- \( c = (1-A/s) \) = the correction factor for curved plating but is not to be taken less than 0.70.
- \( A \) = the distance in mm or in., measured perpendicular from the chord length s to the highest point of the curved plating arc between the two supporting members.

Changes in plating thickness are to be gradual and the need for continuity of overall strength is to be considered. Where closely spaced stiffening members are fitted for local reinforcement, such as floors in way of the ballast keel, or stringers in the slamming area, the plating thickness is in general not to be reduced locally for the lesser spacing.

Where the frame spacing is such that the cold-molded wood laminate thickness can be relatively light for local strength, consideration is to be given to the hull-girder strength of the yacht.

The bottom shell thickness is to be increased in way of the keel for the extent shown, and using the heads given in Figures 7.1 and 7.2.

After all other requirements are met the thickness for steel is, in general, to be not less than \( s/115 \), or 2.5 mm (0.1 in.) whichever is greater and for aluminum in general, the thickness is to be not less than \( s/100 \) or 2.5 mm (0.1 in.) whichever is greater. Special consideration will be given to minimum thicknesses for transversely framed hulls.

7.3 Fiber-Reinforced Plastic

7.3.1 Single-skin Laminate

In general, the structural arrangement is to be as given in 8.1.2a. The thickness of the shell, deck and bulkhead plating is to be not less than given by the following equations.

\[ a \quad t = sc \frac{\sqrt{F}}{\sigma_s} \text{ mm (in.)} \]

\[ b \quad t = 0.75 s \frac{\sqrt{F_{h} \cdot k_{i}}}{\sqrt{0.02E}} \text{ mm (in.)} \]

where \( h \), \( \sigma_s \), and \( c \) are as defined in 7.1.
- \( s \) = the spacing, as defined in 7.1 or the unsupported width, in mm or in., of the laminate panel between supporting structure such as structurally effective, glassed-in bulkheads, bunks, shelves, etc.
- \( F \) = the design head reduction factor given in Table 7.4 for shell plating, and in Table 7.5 for deck plating.

In equation \( a \), \( F \) is not in general to be taken less than \( D \) (see 2.5) for the bottom shell nor less than 0.5D for the side shell plating.

In equation \( b \), \( F \) is not in general to be taken less than 0.5 for the bottom and side shell plating.

\( k \) = the coefficient varying with the plate panel aspect ratio as shown in Table 7.3, not to be taken less than 0.5 for uni-directional laminates

\( k_{i} \) = the coefficient varying with the plate panel aspect ratio as shown in Table 7.3, not to be taken less than 0.028 for uni-directional laminates

\( E \) = the minimum flexural modulus of the laminate in N/mm² (kgf/mm², psi)

Where uni-directional laminates are used for the deck or shell, the warp, or axis containing the greater reinforcement, is in general to run in a forward and aft direction. In addition the warp, or axis containing the greater reinforcement, is in general, to be perpendicular to the longest edge of the laminate panel, that is, parallel to the distance, \( s \).

Special consideration will be given to other arrangements.
7.3.2 Sandwich Construction

In general the structural arrangement is to be as given in 8.1.2b. The section modulus and the moment of inertia of the skins about the neutral axis of a strip of sandwich panel 1 cm (1 in.) wide are to be not less than given by the following equations.

\[
\begin{align*}
a & \quad SM_a = \frac{t_s F}{800T} \quad \text{cm}^3 \quad SM_a = \frac{t_i F}{6T} \quad \text{ins}^3 \\
b & \quad SM_i = \frac{t_i F}{600C} \quad \text{cm}^3 \quad SM_i = \frac{t_i F}{6C} \quad \text{ins}^3 \\
c & \quad I = \frac{t_s E}{5060E_r} \quad \text{cm}^4 \quad I = \frac{t_i E}{5.06 E_r} \quad \text{ins}^4
\end{align*}
\]

Here:

- \( A_s \) = required section modulus to outer skin for 1 cm (1 in.) width of sandwich laminate
- \( SM_i \) = required section modulus to inner skin for 1 cm (1 in.) width of sandwich laminate
- \( t_s \) = required thickness of single-skin laminate given by equation 7.3.1a, in mm or ins.
- \( F \) = maximum flexural strength used in Table 7.2 to obtain \( \sigma_s \) for use in equation 7.3.1a, to determine \( t_s \), in N/mm\(^2\) (kgf/mm\(^2\), psi)
- \( T \) = minimum tensile strength of outer skin, in N/mm\(^2\) (kgf/mm\(^2\), psi)
- \( C \) = minimum compressive strength of the inner skin, in N/mm\(^2\) (kgf/mm\(^2\), psi)
- \( I \) = required moment of inertia of the skins about the neutral axis of the sandwich, for 1 cm (1 in.) width of sandwich laminate.
- \( t_i \) = required thickness of single skins laminate, given by equation 7.3.1b, in mm or ins.
- \( E_r \) = 0.5 \( (E_s + E_i) \) where:
  - \( E_s \) = minimum flexural modulus used in equation 7.3.1b to determine \( t_s \)
  - \( E_i \) = minimum tensile modulus of the inner skin, in N/mm\(^2\) (kgf/mm\(^2\), psi)
  - \( E_i \) = minimum compressive modulus of the outer skin, in N/mm\(^2\) (kgf/mm\(^2\), psi)

In general, the minimum tensile strengths of the outer skin and the inner skin are to be approximately the same. However special consideration will be given to the use of external and internal skins having different strengths. Where both the inner and outer skins are unusually thin, consideration is to be given to the hull-girder strength of the yacht. In calculating the section modulus and inertia of the sandwich, consideration is to be given where the skins have different tensile moduli or different compressive moduli.

The skins are in general to be bi-directional laminates constructed of either uni-directional or bi-directional layers or a combination of both.

In general, single skin laminate is to be used for the bottom shell in way of the keel; the thickness is in general not to be less than the overall thickness of the adjacent sandwich shell, nor less than obtained using the design heads given in Figures 7.1 and 7.2 for the extent shown thereon. In addition, the thickness of the bottom shell extending over the length of the keel attachment to points 50 mm (2 in) forward and aft of the forward and aft keel bolts, respectively, and 50 mm (2 in) outboard of the bolts is not to be less than the diameter of the keel bolts. However special consideration will be given to sandwich construction in way of the keel, provided the inner and outer skins are suitably increased in thickness, a high density core material is used and the keel bolt loads are directly transmitted to, supported by, and effectively distributed into the hull by the floors and side girders.

It is recommended that the required shell reinforcement in way of the keel be extended forward to the mast step structure.

A single skin laminate is to be used for the deck locally in way of the mast; for reinforcement in way of fastenings see 6.3.3.

The thickness of the core and skins are to be not less than given by the following equation.

\[
d = \frac{d_s + d_i}{2} = n v F h s \quad \text{mm (in)}
\]

where:

- \( h \) is as defined in 7.1 and \( s \) is as defined in 7.3.1
- \( d_s \) = overall thickness of sandwich, in mm or ins.
- \( d_i \) = thickness of core, in mm or ins.
- \( v \) = the coefficient varying with plate panel aspect ratio given in Table 7.6, inner and outer skins are to be bi-directional laminates.
- \( F \) = the design head reduction factor for shell plating given in Table 7.7, for decks given in Table 7.5.
- \( \sigma \) = the design stress, in N/mm\(^2\) (kgf/mm\(^2\), psi), 0.5 times minimum ultimate shear strength of the core material (see 4.11).
- \( n = 0.01 \) SI units (0.001 metric units, 0.44 ft-in units)

Where honeycomb type core materials are used, the specified cell size and thickness are to be submitted together with the associated specified minimum shear strength in the direction of the two principal axes of the core. Also, structural plans are to indicate the direction of each principal axis with respect to the yacht structure. Required honeycomb core thickness will be given special consideration.
July 2, 2008
Galveston, TX

DRAFT. A procedure to analyze laminate coupons taken from the hull of the subject vessel.

Laboratory selected:
Structural Composites,
South Melbourne, FL
321-951-9464
Att.: Mr. Arthur Wolfe
904-553-7080 Cel.
Frptestguru@aol.com

Objective: To reveal through physical analysis:
1. The thickness of the samples both before and after surface coating removal.
2. The net glass to resin ratio. (“Net” is defined, for the purpose of this work, as the value sought without considering non-structural materials adhered to the sample.)
3. The laminate schedule by material nomenclature, order and orientation.
4. Identify any fiberglass, resin, or laminate on top of original gelcoat and conduct the aforementioned analysis (#1-3) separately.
5. Anti-fouling paint, epoxy or other barrier coats, any glass added outside of the gelcoat, and the gelcoat proper, exterior as well as interior. Therefore, we request analysis to be done as follows:

**Burn test.** A modified ASTM 2584. Please grind off all exterior non-structural materials mentioned above, including materials on the inside surface of the coupon. Then “cleave” the first layer which is a chopped strand mat (resin rich) and analyze separately the mat section from the rest of the structural materials’ portion.
**Laminate schedule determination:** Sample coupons are marked by number as per list attached, and an orientation line relative to the coupon numbers and their location on the vessel (*See itemized list of coupons below*). Please determine the areal weights of the laminates and in what order and orientation they are present in the sample, starting from the gelcoat layer. We request the laboratory explain the manner in which one layer of Kevlar KE-LT 2300 (0-90) will be handled and what effect will we encounter on the results.

**Coupon Sample Listing**

1. - 1 ft. aft of No. 5 floor, off center to port 1”
2. - At No. 4 floor, fwd face centerline.
3. - At no. 3 floor, aft face on centerline
4. - Port side at end of No. 5 floor 39” from CL (fracture)
5. - On delaminated area to Stbd. Take the 2 delams
6. - Fwd of No. 4 floor 15” off CL. Healthy spot on bottom.
7. - Fwd. face of No. 5 floor 3” off center to port.
8. - Top surface of No. 3 floor (check carbon layers)
9. - About 12 in. above No. 4 sample
10. - 3” to port of CL and 4 “ fwd of No. 5 floor
11. - Beneath engine on CL 20” fwd. of C-27
12. - Aft face, 2” OF CL TO PORT FRAME 4
13. - STARBOARD 13”-10” aft on water line and 10” off CL.
14. - Section 2 of keel laminate including boss
15. - Section 4 of keel laminate including boss
16. - Item 25, starboard side of root of keel about the center
ENCLOSURE (1) Core Sample Testing Protocol

TEST PROGRAM BACKGROUND
Please be advised that some of the samples may contain repairs, on both the interior and exterior surfaces. We are interested in information about these repairs, so to the extent practical, please separate and test any such repair layers/materials found. It appears that the original laminates were made with red tinted catalyst.

OBJECTIVE
To reveal through physical analysis:

1. The thickness of the samples both before and after removal of any repairs and removal of the interior and exterior surface coatings (i.e., anti-fouling paint, gelcoat or other barrier coats, and any laminates added outside of the gelcoat). Please measure thickness at four (4) locations around the circumference, using the orientation line at 90° intervals.

2. The fiber to resin ratio by weight.

3. The laminate schedule by material type and nomenclature (i.e. woven, knit, chop, unidirectional, etc.), sequence, and fiber orientation. Please note that the following list indicates the orientation of each sample relative to the vessel's hull. Please present your ply orientation results relative to our vessel ply orientation indicators. Please present the areal weights in US units.

4. Identify any fiber, resin, or laminate(s) on top of original interior or exterior gelcoat and conduct the aforementioned analyses (#1-3) separately.

BURN TEST (A modified ASTM 2584)
Please conduct the burnout tests on the largest possible portions of each sample coupon.

Prior to the burn testing, please remove all non-structural materials mentioned above, including materials on the inside surface of the coupon. If complete removal of these materials will compromise the integrity of a woven or knit laminate layer, please only remove the coatings until the laminate surface is exposed. Testing with a bit of gelcoat in the crimps or between the rovings is preferable to compromising the determination of the laminate's areal weight.

LAMINATE SCHEDULE DETERMINATION
Sample coupons are marked by number (See ENCLOSED 2) and a reference line relative to their orientation on the vessel. Please determine the areal weights of the laminates and in what order and orientation they are present in the sample, starting from the exterior.

When presenting the test results please use the same sample identification numbers listed below and present the results in Excel® and Adobe Acrobat® formats.

If, based upon your experience, you feel that the presence of carbon or Kevlar® plies within some of the coupons may compromise the accuracy of the proposed testing, please remove these layers and then test the balance of the samples according to the methods discussed above. Please discuss these considerations in your report and describe how the carbon and Kevlar® layers were tested.

Items 14 and 15:
Please do not test the keel to hull mating plate "deadwood" identified by the red XXX marks on the item.
**ENCLOSURE (2) Itemized List of Coupons**

Total of 16 coupons. Items 1 through 13. Items 25 through 27.

<table>
<thead>
<tr>
<th>Evidence Number</th>
<th>Coupon Identification</th>
<th>Line Orientation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 ft. aft of No. 5 floor, off center to port 1&quot;</td>
<td>Fore and Aft</td>
</tr>
<tr>
<td>2</td>
<td>At No. 4 floor, fwd face centerline.</td>
<td>Athwartships</td>
</tr>
<tr>
<td>3</td>
<td>At No. 3 floor, aft face on centerline</td>
<td>Athwartships</td>
</tr>
<tr>
<td>4</td>
<td>Port side at end of No. 5 floor 39&quot; from CL (fracture)</td>
<td>Fore and Aft</td>
</tr>
<tr>
<td>5</td>
<td>On delaminated area to Stbd.</td>
<td>Fore and Aft</td>
</tr>
<tr>
<td>6</td>
<td>Fwd of No. 4 floor 15&quot; off CL. Healthy spot on bottom.</td>
<td>Fore and Aft</td>
</tr>
<tr>
<td>7</td>
<td>Fwd face of No. 5 floor 3&quot; off center to port.</td>
<td>Athwartships</td>
</tr>
<tr>
<td>8</td>
<td>Top surface of No. 3 floor (check carbon layers)</td>
<td>Fore and Aft</td>
</tr>
<tr>
<td>9</td>
<td>About 12 in. above No. 4 sample</td>
<td>Fore and Aft</td>
</tr>
<tr>
<td></td>
<td>Description</td>
<td>Location</td>
</tr>
<tr>
<td>----</td>
<td>-----------------------------------------------------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>10</td>
<td>3&quot; to port of CL and 4&quot; fwd of No. 5 floor</td>
<td>Fore and Aft</td>
</tr>
<tr>
<td>11</td>
<td>Beneath engine on CL 20&quot; fwd. of C-27</td>
<td>Fore and Aft</td>
</tr>
<tr>
<td>12</td>
<td>Aft face, 2&quot; of CL to port frame 4</td>
<td>Athwartships</td>
</tr>
<tr>
<td>13</td>
<td>Starboard 13&quot;-10&quot; aft on water line and 10&quot; off CL.</td>
<td>Fore and Aft</td>
</tr>
<tr>
<td>25</td>
<td>Starboard side of root of keel about the center</td>
<td>Fore and Aft</td>
</tr>
<tr>
<td>26</td>
<td>Section 2 of keel laminate including boss</td>
<td>Fore and Aft</td>
</tr>
<tr>
<td>27</td>
<td>Section 4 of keel laminate including boss</td>
<td>Fore and Aft</td>
</tr>
</tbody>
</table>
Glossary of terms
Structural Composites Inc.
Test results.

August 20, 2008

Ply: It numbers the layer of material
Outer Surface: The outside of the boat
Material: Describes the type glass material used
CS: Chopped Strand
KN: Knitted material (fiber bundles are not woven)
BX: Bi-axial material- It describes the orientation in degrees.
WR: A woven roving material which is woven instead of straight bundles sewn together.
Cloth: A woven material of very low weight. It looks like cloth made of fiberglass strands.
Putty: A thick material made with resin that sets when catalyzed. Used as a filler, has very low structural values.
Weight: The description includes the weight per unit of the material used. (ounces per foot or yard) 
Notes: Describes what is there on the outer or inner surfaces, plus the Kevlar used in the laminate.
Thickness: Describe the average thickness around the sample.
ASTM 2584: The American Standards Testing and Materials. The number of the test used.
Resin to Glass Ratio: Described as weight% of each material. The ratio will be, for example: 53/47
ANCON MARINE CONSULTANTS, INC.
MARINE ENGINEERS
ST. JAMES CITY, FLORIDA

THE CYNTHIA WOODS KEEL LOSS CASE
USCG

July 2, 2008
Galveston, TX

DRAFT. A procedure to analyze laminate coupons taken from the hull of the subject vessel.

Laboratory selected:
Structural Composites,
South Melbourne, FL
321-951-9464
Att.: Mr. Arthur Wolfe
904-553-7080 Cel.
Frptestguru@aol.com

Objective: To reveal through physical analysis, the thickness of the samples, the net glass to resin ratio, and the laminate schedule by material nomenclature, order and orientation. “Net” is defined, for the purpose of this work, as the value sought without considering non structural materials adhered to the sample, such as: Anti-fouling paint, epoxy or other barrier coats, any glass added outside of the gelcoat, and the gelcoat proper, exterior as well as interior. Therefore, we request analysis to be done as follows:

Burn test. A modified ASTM 2584. We would like to grind off all exterior non-structural materials mentioned above, including
materials on the inside surface of the coupon. Furthermore, we would like to "Cleave" the first layer which is a chopped strand mat (resin rich) and analyze separately the mat section from the rest of the structural materials' portion.

Laminate schedule determination: Sample coupons are marked by number as per list attached, and an orientation line simulating a for and aft direction. We would like to know what materials, in what order and orientation exist in the sample, starting from the gelcoat layer. We request the laboratory explains to us the manner in which one layer of Kevlar KE-LT 2300 (0-90) will be handled and what effect will we encounter on the results.
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<thead>
<tr>
<th>No.</th>
<th>Avg. Thck.</th>
<th>Resin %</th>
<th>Glass %</th>
<th>Dsg. Comp.</th>
<th>COMMENTS</th>
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**MATERIALS' CHARACTERISTICS USED IN CALCULATIONS**
ANCON MARINE CONSULTANTS, INC.
MARINE ENGINEERS
ST. JAMES CITY, FLORIDA

CYNTHIA WOODS CASE
CORE SAMPLES LIST.
JULY 1 and 2, 2008

1.- 1 ft. aft of No. 5 floor, off center to port 1”
2.- At No. 4 floor, fwd face centerline.
3.- At no. 3 floor, aft face on centerline
4.- Port side at end of No. 5 floor 39” from CL (fracture)
5.- On delaminated area to Stbd. Take the 2 delams
6.- Fwd of No. 4 floor 15” off CL. Healthy spot on bottom.
7.- Fwd. face of No. 5 floor 3” off center to port.
8.- Top surface of No. 3 floor (check carbon layers)
9.- About 12 in. above No. 4 sample

10.- 3” to port of CL and 4” fwd of No. 5 floor
11.- Beneath engine on CL 20” fwd. of C-27
12.- Aft face, 2” OF CL TO PORT FRAME 4
13.- STARBOARD 13”-10” aft on water line and 10” off CL.
14.- Section 2 of keel laminate including boss
15.- Section 4 of keel laminate including boss
16.- Item 25, starboard side of root of keel about the center

26.- Hull laminate on keel section, under plates
27.- Same
Appendix No. 9
(AP-9)
THE CYNTHIA WOODS
Core sample locations
Kiko Villalon
August 26, 2008

14- keel plate
15- keel plate
16- keel plate center
Appendix No. 10
(AP-10)
Appendix No. 10
(AP-10)

Also referred to as
Attachment B
To Bill Richards
Yacht Design Report
(AT-B)
### Description of Floor #5

**E Base**

<table>
<thead>
<tr>
<th>ITEM</th>
<th>E</th>
<th>WIDTH b</th>
<th>Cont/Bl</th>
<th>Thick h</th>
<th>EAE<em>E</em>h</th>
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</table>

**Dist to NA (in).**

- 1.85

**MOI about NA (in^4).**

- 156.40

**SM top (in^3).**

- 27.66

**SM bottom (in^3).**

- 83.86

*Corrected for E value in stringer top*

**Description of Floor #5**

<table>
<thead>
<tr>
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<th>E</th>
<th>WIDTH b</th>
<th>Cont/Bl</th>
<th>Thick h</th>
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<td>6.31</td>
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</table>

**Dist to NA (in).**

- 1.34

**MOI about NA (in^4).**

- 87.77

**SM top (in^3).**

- 14.19

**SM bottom (in^3).**

- 65.65
<table>
<thead>
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<th>Description</th>
<th>Floor #5</th>
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<th>Length/Base</th>
<th>Thick h</th>
<th>EA=E<em>b</em>h</th>
<th>d above BL</th>
<th>Ad</th>
<th>Ad^2</th>
<th>Io</th>
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| Dist to NA (in)             | 1.61     |          |             |         |           |            |        |        |
| MOI about NA (in^4)         | 76.50    |          |             |         |           |            |        |        |
| SM top (in^3)               | 13.61    | 7.64     | 10.1        |         | 2.53 PASS |            |        |        |
| SM bottom (in^3)            | 47.55    | 27.76    | 36.6        | 9.16    |           |            |        |        |

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<th>Length/Base</th>
<th>Thick h</th>
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<th>d above BL</th>
<th>Ad</th>
<th>Ad^2</th>
<th>Io</th>
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<p>| Dist to NA (in)             | 1.75     |          |             |         |           |            |        |        |
| MOI about NA (in^4)         | 58.51    |          |             |         |           |            |        |        |
| SM top (in^3)               | 12.00    | 7.35     | 9.06        | 2.53    |           |            |        |        |
| SM bottom (in^3)            | 33.33    | 28.7     | 32.78       | 9.16    |           |            |        |        |</p>
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<th>EA=E<em>b</em>h</th>
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<td>1.39</td>
<td>3.40</td>
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<td>0.40</td>
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9.88  17.24  #4.57  4.034

| Dist to NA (in) | 1.75 |
| MOI about NA (in^4) | 58.51 |
| SM top (in^3)    | 12.00 |
| SM bottom (in^3) | 33.53 |

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<th>Emmat/Base</th>
<th>Thick h</th>
<th>EA=E<em>b</em>h</th>
<th>d above BL</th>
<th>Ad</th>
<th>Ad^2</th>
<th>Io</th>
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<td>3.24</td>
<td>1.00</td>
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<td>6.33</td>
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<td>3.00</td>
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9.84  16.72  79.82  3.701

| Dist to NA (in) | 1.70 |
| MOI about NA (in^4) | 55.13 |
| SM top (in^3)    | 11.60 |
| SM bottom (in^3) | 32.45 |

PASS  FAIL, BUT NEGLIGIBLE
### Description

**Floor #2**

**Corrected for E value in stringer top and as built bottom thickness**

**E Base**

1.00

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<th>d above BL</th>
<th>Ad</th>
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10.45

17.26

81.50

3.743

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<tr>
<td>SM top (in^3)</td>
<td>11.70</td>
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<tr>
<td>SM bottom (in^3)</td>
<td>34.37</td>
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**SM Req'd General**

**SM Req'd Grounding**

**SM Req'd Grounding Vertical**

PASS

PASS
Appendix No. 10
(AP-10)

Also referred to as
Attachment A
To Bill Richards
Yacht Design Report
(AT-A)
Cynthia Woods
Shear Calculation at Keel Root

ATTACHMENT A

<table>
<thead>
<tr>
<th>Keel Station</th>
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<td>9</td>
<td>0.53</td>
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<tr>
<td>10</td>
<td>0.01</td>
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</tbody>
</table>

Keel Weight (W) 4670 lbs
Keel Moment Arm (L) 40 inches
Keel Chord Length (CL) 42 inches
Allowable Sheer Stress (perpendicular to warp, XM mat) 18500 psi

Sum 16.09
Avg. Offset 1.463

Force on keel perimeter 127706.65 lbs

AS DESIGNED
Stress at 1.0" Thickness 3040.6 psi
Factor of Safety 6.08

AS BUILT
Stress at .58" Thickness 5242.5 psi
Factor of Safety 3.53
Structural Composites
Testing Report
10 September 2008

Mr. Augusto (Kiko) Villalon
Ancon Marine Consultants Inc.
3859 Cruz Dive
St. James City, FL 33956

Re: S/V Cynthia Woods

Dear Mr. Villalon,

I have completed the testing on the samples received from the USCG Marine Safety Unit Galveston. These samples were received on July 14th, 2008. The samples were contained in sealed evidence bags. This report contains the results of this testing process.

Procedure

The procedure for testing of the samples was provided by the USCG (see J.E. Elliott letter dated 07 July 2008). This involved recording of the sample dimensions, removal of coatings, resin burn-out, and laminate ply-by-ply analysis.

As each sample was removed from the evidence bag, the date opened was recorded directly on the bag. The laminate thickness was measured in four places, spaced 90 degrees apart. The presence of any coatings was noted, and their thickness estimated.

Prior to testing, the coatings were mostly removed. This was accomplished by grinding down the surface until resin and reinforcement were just beginning to be visible. At this point the grinding was stopped, so as not to remove reinforcement. Thus the samples were tested with a slight amount of residual coating on the specimen (where coating was present).

In some cases, the samples were cut in half prior to test. After dimensioning and weighing, the specimens were placed in ceramic crucibles for resin burn-out. The crucibles were then placed in a muffle furnace, and heated to a temperature of 1050°F, for a minimum of 3 hours. This procedure corresponds to ASTM D2584, “Standard Test Method for Ignition Loss of Cured Reinforced Resins”.

After the resin had been completely burned out of the laminate stack, the crucibles were removed from the oven. The remaining reinforcement was then weighed, for the resin:reinforcement ratio calculation.
The ply-by-ply laminate schedule was then determined, by separating out the individual plies of reinforcement in the laminate stack. These individual plies were weighed, so that the approximate areal weight of reinforcement (oz/ft² or oz/yd²) could be calculated. An individual report was generated for each sample. The report contains the average thickness of each sample, the resin/reinforcement content (weight %), and the results of the ply-by-ply reinforcement analysis.

Respectfully Submitted,

Arthur R. Wolfe
Vice President
General Notes on Testing & Analysis of the Samples:

1. Many of the samples contained a fiberglass/Kevlar hybrid reinforcement near the outer hull surface. This ply was usually just inboard of the outermost +/− 45° fiberglass ply. As the Kevlar was burned out along with the resin, the weight of Kevlar was estimated, and considered in the calculation of reinforcement content.

2. Coatings, where present, are indicated on the report sheets. The thickness of the coatings was estimated visually, and by use of a micrometer.

3. The alignment of the reinforcement plies was generally in very good agreement with the lines drawn on the samples. Any plies where the alignment seemed to be off of the marked axis are noted below.

4. Several of the samples seemed to contain a ply or two of reinforcement, and perhaps putty, which had been added to the exterior surface, over a paint or gelcoat layer. These are noted in the reports. It was not possible to remove these plies and test them separately. The entire sample was tested as one piece.

5. The sample thickness as shown on the report sheets reflects the average value after removal of coatings.

6. The estimated accuracy of the reinforcement weights as reported is +/− 10%, due to weighing errors, dimensional errors, variability in areal weight of reinforcements, deviations from nominal areal weight of reinforcements, draping of fabric during handling, etc.
Individual Notes on the Samples:

1. Sample #001 – The sample contained a ply of 0/90 hybrid reinforcement (glass/Kevlar) just beneath the exterior ply of +/- 45° glass reinforcement. This could not be removed prior to test. Coatings included blue paint (1-2 mils) and white gelcoat (~20 mils) outer, and white paint/gel (~3 mils) inner.

2. Sample #002 – There were no coatings on this sample. The exterior surface appeared to be glossy resin. The sample consisted of an outer FRP skin, with some attached foam core. The foam core was ground off prior to test. Also, the outer FRP skin was cracked upon receipt.

3. Sample #003 – This sample has a very thin (~2 mils) exterior white coating. The FRP skin was cracked upon receipt. The adhering foam core was removed prior to test.

4. Sample #004 – The sample was wet (damp) upon receipt. There were interlaminar fractures (delaminations) near the outer and inner surfaces. The outer surface was coated with blue paint (~2 mils) and white gelcoat (~20 mils). The sample was dried prior to test. This sample contained the same glass/Kevlar hybrid ply indicated in #001 above.

5. Sample #005 – This sample was also delaminated at 2 places within the laminate stack. The outer surface was coated with blue paint (~2 mils), a thin putty/glass layer, and thin white gelcoat. The inner surface was coated with white gelcoat (~25 mils). The sample appeared to have had some plies added to the exterior surface (putty, cloth, woven roving). The sample was dried prior to test. This sample contained the same glass/Kevlar hybrid ply indicated in #001 above.

6. Sample #006 – The sample contained several partial plies of reinforcement (areas where the ply of reinforcement did not extend across the entire surface of the sample). Therefore, this thickness varied between 0.56” and 0.89”. Coatings included blue paint (1-2 mils) and white gelcoat (~18 mils) outer, and white paint/gel (~2 mils) inner. This sample contained the same glass/Kevlar hybrid ply indicated in #001 above.

7. Sample #007 – No coatings were present. The outer FRP skin was removed from adhering green foam core prior to test.

8. Sample #008 – The exterior surface was coated with white paint or gelcoat (thickness 10-14 mils). This sample also contained what appeared to be unidirectional carbon reinforcement. The weight of the carbon reinforcement has been estimated.

9. Sample #009 – This sample contained some partial plies. There was a delamination approximately 3/5 of the way inboard from the outer surface. The sample thickness varied from 0.58” – 0.87”. Coatings present were outer blue paint (1-2 mils), beneath which was white gelcoat (10-14 mils). The inner surface was coated with white gel/paint (5-7 mils). This sample contained the same glass/Kevlar hybrid ply indicated in #001 above.

10. Sample #010 – Partial plies were present on the inner surface. These partial plies were delaminated upon receipt. Coatings included blue paint (1-2 mils) on the outer surface, and white paint/gelcoat on the inner surface (8-15 mils). Glass
reinforcement and putty were evident between the outer blue paint and the outer gelcoat, perhaps indicating a repaired area. This sample contained the same glass/Kevlar hybrid ply indicated in #001 above.

11. Sample #011 – The sample had blue paint on the outer surface (1-2 mils), followed by white gelcoat (~20 mils). There was no coating on the inner surface. This sample contained the same glass/Kevlar hybrid ply indicated in #001 above.

12. Sample #012 – No coatings were present on the sample. The outer surface appeared to be glossy resin. A small amount of foam remaining on the back surface was removed prior to test.

13. Sample #013 – Coatings present included blue paint (2-3 mils) on the exterior, followed by white gelcoat (22-24 mils). An interior white coating was 1-2 mils thick. The sample contained numerous partial plies. The sample thickness was approximately 0.7"-0.8", going up to 0.87" in the area of partial plies. This sample contained the same glass/Kevlar hybrid ply indicated in #001 above.

14. Sample #026 – This sample two distinct laminates in one piece. The overlying “keel to hull mating plate” was removed prior to test. The mating plate was bonded directly to the exterior gelcoat surface. This sample contained the same glass/Kevlar hybrid ply indicated in #001 above.

15. Sample #027 – This sample was similar to #026.

Respectfully Submitted,

[Signature]

Arthur R. Wolfe
Vice President
## FRP Laminate Analysis

**Sample #001**  
Vessel: S/V Cynthia Woods  
Laminate Ply-by-Ply Analysis (hole saw cutout received)

<table>
<thead>
<tr>
<th>Ply</th>
<th>Material</th>
<th>Approximate Weight</th>
<th>Notes</th>
</tr>
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<tbody>
<tr>
<td>1</td>
<td>CS</td>
<td>1.0 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>+/45 KN BX</td>
<td>12.3 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0/90 KN BX</td>
<td>~23 oz/yd²</td>
<td>(Glass/Kevlar hybrid, estimated weight)</td>
</tr>
<tr>
<td>4</td>
<td>CS</td>
<td>0.7 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0/90 KN BX</td>
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<td></td>
</tr>
<tr>
<td>6</td>
<td>CS</td>
<td>0.9 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>0/90 KN BX</td>
<td>24.0 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>CS</td>
<td>0.6 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>0/90 KN BX</td>
<td>25.2 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>CS</td>
<td>0.9 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>+/-45 KN BX</td>
<td>12.1 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>CS</td>
<td>1.0 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>13</td>
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<td>12.6 oz/yd²</td>
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<tr>
<td>14</td>
<td>CS</td>
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</tr>
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<td>15</td>
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<tr>
<td>22</td>
<td>CS</td>
<td>1.1 oz/ft²</td>
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**Inner Surface**  
- - - (white gelpaint ~3 mils)

**Average Thickness**: 0.604 in.

**ASTM D 2584**

- Resin Content: 53.0 % by weight
- Reinforcement Content: 47.0 % by weight

**Notes**: Values represent the results from 1 test specimen (ASTM D 2584).  
CS = chopped strand, KN BX = knitted biaxial, WR = woven roving

I hereby certify that the test results contained in this report are true and accurate within the limits of the measuring devices employed. All mass and dimensional measuring devices are calibrated according to ASTM standards. The test equipment is calibrated with standards traceable to NIST.

*Arthur R. Wolfe*  
Vice President

REPORT - 001
FRP Laminate Analysis

Sample #002
Vessel: S/V Cynthia Woods
Laminate Ply-by-Ply Analysis (hole saw cutout received)

Report No. 8015-160-002
Dated 14 Aug 08

<table>
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<th>Weight</th>
<th>Notes</th>
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<td>3</td>
<td>0/90 KN BX</td>
<td>11.6 oz/yd²</td>
<td>(partial ply)</td>
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<td>CS</td>
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<td>7</td>
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<td>17.0 oz/yd²</td>
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<tr>
<td>8</td>
<td>CS</td>
<td>1.5 oz/ft²</td>
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</table>

Inner Surface
- - - (foam core)

Average Thickness 0.231 in.

ASTM D 2584
- Resin Content 50.9 % by weight
- Reinforcement Content 49.1 % by weight

Notes: Values represent the results from 1 test specimen (ASTM D 2584).
CS = chopped strand, KN BX = knitted biaxial, \( \text{WR} \) = woven roving

I hereby certify that the test results contained in this report are true and accurate within the limits of the measuring devices employed. All mass and dimensional measuring devices are calibrated according to ASTM standards. The test equipment is calibrated with standards traceable to NIST.

Arthur R. Wolfe
Vice President

REPORT - 002
FRP Laminate Analysis

Sample #003
Vessel: S/V Cynthia Woods
Laminate Ply-by-Ply Analysis

Report No. 8015-160-003
Dated 14 Aug 08
(hole saw cutout received)

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<th>Notes</th>
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<td>2</td>
<td>CS</td>
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</tr>
<tr>
<td>3</td>
<td>KN BX</td>
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<td>partial ply</td>
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<td>4</td>
<td>CS</td>
<td>0.6 oz/ft²</td>
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<tr>
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<td>KN BX</td>
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</tr>
<tr>
<td>6</td>
<td>CS</td>
<td>1.0 oz/ft²</td>
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</tr>
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</table>

Inner Surface

Average Thickness 0.168 in.

ASTM D 2584

Resin Content 51.1 % by weight
Reinforcement Content 48.8 % by weight

Notes: Values represent the results from 1 test specimen (ASTM D 2584). CS = chopped strand, KN BX = knitted biaxial, WR = woven roving

[Signature]
Arthur R. Wolfe
Vice President

I hereby certify that the test results contained in this report are true and accurate within the limits of the measuring devices employed. All mass and dimensional measuring devices are calibrated according to ASTM standards. The test equipment is calibrated with standards traceable to NIST.
FRP Laminate Analysis

Sample #004
Vessel: S/V Cynthia Woods
Laminate Ply-by-Ply Analysis (hole saw cutout received)

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<td>CS</td>
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<tr>
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<td></td>
</tr>
<tr>
<td>3</td>
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<td>~ 18 oz/yd²</td>
<td>(Glass/Kevlar hybrid, estimated weight)</td>
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<tr>
<td>5</td>
<td>0/90 KN BX</td>
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<tr>
<td>6</td>
<td>CS</td>
<td>0.9 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>7</td>
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<td>12.4 oz/yd²</td>
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</tr>
<tr>
<td>8</td>
<td>CS</td>
<td>1.4 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>0/90 KN BX</td>
<td>25.7 oz/yd²</td>
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</tr>
<tr>
<td>10</td>
<td>CS</td>
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<td></td>
</tr>
<tr>
<td>11</td>
<td>0/90 KN BX</td>
<td>22.2 oz/yd²</td>
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</tr>
<tr>
<td>Inner Surface</td>
<td>-</td>
<td>-</td>
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</tr>
</tbody>
</table>

Average Thickness 0.462 in.

ASTM D 2584
- Resin Content 54.9 % by weight
- Reinforcement Content 45.1 % by weight

Notes: Values represent the results from 1 test specimen (ASTM D 2584).
CS = chopped strand, KN BX = knitted biaxial, WR = woven roving

I hereby certify that the test results contained in this report are true and accurate within the limits of the measuring devices employed. All mass and dimensional measuring devices are calibrated according to ASTM standards. The test equipment is calibrated with standards traceable to NIST.

Arthur R. Wolfe
Vice President
FRP Laminate Analysis

Sample #005  
Vessel: S/V Cynthia Woods  
Laminate Ply-by-Ply Analysis  
(hole saw cutout received)

<table>
<thead>
<tr>
<th>Ply</th>
<th>Material</th>
<th>Weight</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cloth/Putty</td>
<td>9.1 oz/yd²</td>
<td>(-)</td>
</tr>
<tr>
<td>2</td>
<td>WR/Putty</td>
<td>- oz/yd²</td>
<td>(partial roving present)</td>
</tr>
<tr>
<td>3</td>
<td>CS/Putty</td>
<td>2.2 oz/ft²</td>
<td>(white gel ~22 mils between 3 &amp; 4)</td>
</tr>
<tr>
<td>4</td>
<td>+/-45 KN BX</td>
<td>12.7 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0/90 KN BX</td>
<td>~ 23 oz/yd²</td>
<td>(Glass/Kevlar hybrid, estimated weight)</td>
</tr>
<tr>
<td>6</td>
<td>CS</td>
<td>0.4 oz/ft²</td>
<td>(partial ply)</td>
</tr>
<tr>
<td>7</td>
<td>0/90 KN BX</td>
<td>16.9 oz/yd²</td>
<td>(partial ply)</td>
</tr>
<tr>
<td>8</td>
<td>CS</td>
<td>0.9 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>0/90 KN BX</td>
<td>26.5 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>CS</td>
<td>0.8 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>+/-45 KN BX</td>
<td>12.3 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>CS</td>
<td>0.9 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>+/-45 KN BX</td>
<td>12.5 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>CS</td>
<td>1.0 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>+/-45 KN BX</td>
<td>13.1 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>CS</td>
<td>0.8 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>0/90 KN BX</td>
<td>25.3 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>CS</td>
<td>0.8 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>0/90 KN BX</td>
<td>19.9 oz/yd²</td>
<td>(partial ply)</td>
</tr>
<tr>
<td>20</td>
<td>CS</td>
<td>1.8 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>0/90 KN BX</td>
<td>25.1 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>CS</td>
<td>1.5 oz/ft²</td>
<td></td>
</tr>
</tbody>
</table>

Average Thickness: 0.678 in. (sample is delaminated into 3 pieces)

ASTM D 2584
- Resin Content: 55.2 % by weight
- Reinforcement Content: 44.8 % by weight

Notes: Values represent the results from 1 test specimen (ASTM D 2584).
CS = chopped strand, KN BX = knitted triaxial, WR = woven roving.

I hereby certify that the test results contained in this report are true and accurate within the limits of the measuring devices employed. All mass and dimensional measuring devices are calibrated according to ASTM standards. This test equipment is calibrated with standards traceable to NIST.

[Signature]
Arthur R. Wolfe
Vice President
# FRP Laminate Analysis

Sample #006  
Vessel: S/V Cynthia Woods  
Laminate Ply-by-Ply Analysis  
(hole saw cutout received)

<table>
<thead>
<tr>
<th>Ply</th>
<th>Material</th>
<th>Weight</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CS</td>
<td>1.9 oz/ft²</td>
<td>(blue paint = 1 mil, white gel = 20 mils)</td>
</tr>
<tr>
<td>2</td>
<td>+/-45 KN BX</td>
<td>12.2 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0/90 KN BX</td>
<td>~ 23 oz/yd²</td>
<td>(Glass/Kevlar hybrid, estimated weight)</td>
</tr>
<tr>
<td>4</td>
<td>CS</td>
<td>1.2 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0/90 KN BX</td>
<td>25.0 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>CS</td>
<td>0.8 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>+/-45 KN BX</td>
<td>12.4 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>CS</td>
<td>1.0 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>+/-45 KN BX</td>
<td>12.4 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>CS</td>
<td>1.7 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>0/90 KN BX</td>
<td>25.1 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>CS</td>
<td>0.9 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>0/90 KN BX</td>
<td>24.6 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>CS</td>
<td>0.3 oz/ft²</td>
<td>(partial ply)</td>
</tr>
<tr>
<td>15</td>
<td>0/90 KN BX</td>
<td>- oz/yd²</td>
<td>(partial ply)</td>
</tr>
<tr>
<td>16</td>
<td>CS</td>
<td>0.4 oz/ft²</td>
<td>(partial ply)</td>
</tr>
<tr>
<td>17</td>
<td>0/90 KN BX</td>
<td>- oz/yd²</td>
<td>(partial ply)</td>
</tr>
<tr>
<td>18</td>
<td>CS</td>
<td>2.7 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>0/90 KN BX</td>
<td>25.0 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>CS</td>
<td>1.8 oz/ft²</td>
<td></td>
</tr>
</tbody>
</table>

Average Thickness 0.718 in.

ASTM D 2584  
Resin Content 57.2 % by weight  
Reinforcement Content 42.8 % by weight

Notes:  
Values represent the results from 1 test specimen (ASTM D 2584).  
CS = chopped strand, KN BX = knitted biaxial, WR = woven roving  
I hereby certify that the test results contained in this report are true and accurate  
within the limits of the measuring devices employed. All mass and dimensional measuring  
devices are calibrated according to ASTM standards. The test equipment  
is calibrated with standards traceable to NIST.

Arthur R. Wolfe  
Vice President

REPORT - 006
## FRP Laminate Analysis

**Sample #007**

**Vessel:** S/V Cynthia Woods

**Laminate Ply-by-Ply Analysis**

(hole saw cutout received)

<table>
<thead>
<tr>
<th>Ply</th>
<th>Material</th>
<th>Approximate Weight</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>WR</td>
<td>18.6 oz/yd²</td>
<td>(serial ply)</td>
</tr>
<tr>
<td>2</td>
<td>WR</td>
<td>20.5 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>CS/BX</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>0/90 KN BX</td>
<td>16.0 oz/yd²</td>
<td>(partial ply, may have been ground down)</td>
</tr>
<tr>
<td>5</td>
<td>CS</td>
<td>0.9 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>0/90 KN BX</td>
<td>15.8 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>CS</td>
<td>0.7 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>0/90 KN BX</td>
<td>22.5 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>CS</td>
<td>0.7 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>0/90 KN BX</td>
<td>25.4 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>CS</td>
<td>0.8 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>0/90 KN BX</td>
<td>23.1 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>CS</td>
<td>1.0 oz/ft²</td>
<td></td>
</tr>
</tbody>
</table>

**Inner Surface**

- -

**Average Thickness**

0.385 in.

**ASTM D 2584**

- Resin Content: 52.7 % by weight
- Reinforcement Content: 47.3 % by weight

Notes: Values represent the results from 1 test specimen (ASTM D 2584).

CS = chopped strand, KN BX = knitted biaxial, WR = woven roving

I hereby certify that the test results contained in this report are true and accurate within the limits of the measuring devices employed. All mass and dimensional measuring devices are calibrated according to ASTM standards. The test equipment is calibrated with standards traceable to NIST.

Arthur R. Wolfe
Vice President

REPORT - 007
FRP Laminate Analysis

Sample #008
Vessel: S/V Cynthia Woods
Laminate Ply-by-Ply Analysis

(hole saw cutout received)

<table>
<thead>
<tr>
<th>Ply</th>
<th>Material</th>
<th>Approximate Weight</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outer Surface</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>1</td>
<td>0/90 KN BX</td>
<td>20.0 oz/yd²</td>
<td>(white gelcoat, 10-14 mils)</td>
</tr>
<tr>
<td>2</td>
<td>CS</td>
<td>1.0 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0/90 KN BX</td>
<td>16.8 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>CS</td>
<td>0.7 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0/90 KN BX</td>
<td>17.9 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>CS</td>
<td>2.2 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>0 UNI</td>
<td>~38 oz/yd² (appears to be carbon unidirectional)</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>CS</td>
<td>1.4 oz/ft²</td>
<td></td>
</tr>
</tbody>
</table>

Inner Surface | - | - | - |

Average Thickness 0.439 in.

ASTM D 2584

Resin Content* 68.0 % by weight *(false high value because of carbon burning away*
Reinforcement Content 32.0 % by weight

Notes: Values represent the results from 1 test specimen (ASTM D 2584).
CS = chopped strand, KN BX = knitted bi axial, WR = woven roving

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Arthur R. Wolfe
Vice President

REPORT - 008
FRP Laminate Analysis

Sample #009
Vessel: S/V Cynthia Woods
Laminate Ply-by-Ply Analysis (hole saw cutout received)

<table>
<thead>
<tr>
<th>Ply</th>
<th>Material</th>
<th>Approximate Weight</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CS</td>
<td>2.0 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>+/45 KN BX</td>
<td>12.0 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0/90 KN BX</td>
<td>~ 23 oz/yd²</td>
<td>(Glass/Kevlar hybrid, estimated weight)</td>
</tr>
<tr>
<td>4</td>
<td>0/90 KN BX</td>
<td>-</td>
<td>oz/yd² (Glass/Kevlar hybrid, partial ply)</td>
</tr>
<tr>
<td>5</td>
<td>CS</td>
<td>4.0 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>0/90 KN BX</td>
<td>26.3 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>CS</td>
<td>1.8 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>0/90 KN BX</td>
<td>26.0 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>CS</td>
<td>1.2 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>+/45 KN BX</td>
<td>12.9 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>CS</td>
<td>0.7 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>0/60 KN BX</td>
<td>26.9 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>CS</td>
<td>1.2 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>0/90 KN BX</td>
<td>24.7 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>CS</td>
<td>1.1 oz/ft²</td>
<td></td>
</tr>
</tbody>
</table>

Inner Surface: -

Average Thickness: 0.635 in.

ASTM D 2584

- Resin Content: 57.0 % by weight
- Reinforcement Content: 43.0 % by weight

Notes: Values represent the results from 1 test specimen (ASTM D 2584).

CS = chopped strand, KN BX = knitted biaxial, WR = woven roving

I hereby certify that the test results contained in this report are true and accurate within the limits of the measuring devices employed. All mass and dimensional measuring devices are calibrated according to ASTM standards. The test equipment is calibrated with standards traceable to NIST.

Arthur R. Wolfe
Vice President

REPORT - 009
### FRP Laminate Analysis

Sample #010
Vessel: S/V Cynthia Woods
Laminate Ply-by-Ply Analysis

<table>
<thead>
<tr>
<th>Ply</th>
<th>Material</th>
<th>Weight</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cloth/Putty</td>
<td>6.1 oz/ft²</td>
<td>(Two part -1 mi. white gel -16 hrs)</td>
</tr>
<tr>
<td>2</td>
<td>WR/Putty</td>
<td>-</td>
<td>(Perforated joint)</td>
</tr>
<tr>
<td>3</td>
<td>CS</td>
<td>2.0 oz/ft²</td>
<td>(Joint coating between 2 &amp; 3)</td>
</tr>
<tr>
<td>4</td>
<td>0°/45 KN BX</td>
<td>12.6 oz/ft²</td>
<td>(Glass fiber hybrid, estimated weight)</td>
</tr>
<tr>
<td>5</td>
<td>0°/90 KN BX</td>
<td>-23 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>CS</td>
<td>0.8 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>0°/90 KN BX</td>
<td>25.3 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>CS</td>
<td>0.7 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>0°/90 KN BX</td>
<td>25.9 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>CS</td>
<td>1.0 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>0°/45 KN BX</td>
<td>11.6 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>CS</td>
<td>1.0 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>0°/45 KN BX</td>
<td>12.6 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>CS</td>
<td>0.9 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>0°/45 KN BX</td>
<td>12.7 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>CS</td>
<td>0.8 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>0°/90 KN BX</td>
<td>25.5 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>CS</td>
<td>0.8 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>0°/90 KN BX</td>
<td>23.2 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>CS</td>
<td>1.8 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>0°/90 KN BX</td>
<td>24.9 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>CS</td>
<td>1.1 oz/ft²</td>
<td></td>
</tr>
</tbody>
</table>

Inner Surface

- - - (White gel - 6-15 hrs)

Average Thickness: 0.700 in. (Sample is delaminated into 3 pieces)

ASTM D 2584
- Resin Content: 54.8 % by weight
- Reinforcement Content: 45.2 % by weight

Notes: Values represent the results from 1 test specimen (ASTM D 2584).
CS = chopped strand, KN BX = knitted biaxial, WR = woven roving

I hereby certify that the test results contained in this report are true and accurate within the limits of the measuring devices employed. All mass and dimensional measuring devices are calibrated according to ASTM standards. The test equipment is calibrated with standards traceable to NIST.

Arthur R. Wolfe
Vice President
FRP Laminate Analysis

Sample #011
Vessel: S/V Cynthia Woods
Laminate Ply-by-Ply Analysis
(hole saw cutout received)

<table>
<thead>
<tr>
<th>Ply</th>
<th>Material</th>
<th>Approximate Weight</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CS</td>
<td>1.7 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>+/-45 KN BX</td>
<td>13.0 oz/yd²</td>
<td>(Glass/Kevlar hybrid, estimated weight)</td>
</tr>
<tr>
<td>3</td>
<td>0/90 KN BX</td>
<td>~ 23 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>CS</td>
<td>0.8 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0/90 KN BX</td>
<td>25.3 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>CS</td>
<td>1.5 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>0/90 KN BX</td>
<td>23.7 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>CS</td>
<td>0.5 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>0/90 KN BX</td>
<td>26.0 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>CS</td>
<td>0.9 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>+/-45 KN BX</td>
<td>12.6 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>CS</td>
<td>0.7 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>0/90 KN BX</td>
<td>26.0 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>CS</td>
<td>0.7 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>0/90 KN BX</td>
<td>20.8 oz/yd²</td>
<td>(partially ground down)</td>
</tr>
</tbody>
</table>

Average Thickness 0.399 in.

ASTM D 2584
Resin Content 48.7 % by weight
Reinforcement Content 51.3 % by weight

Notes:
Values represent the results from 1 test specimen (ASTM D 2584).
CS = chopped strand, KN BX = knitted biaxial, WR = woven roving

I hereby certify that the test results contained in this report are true and accurate within the limits of the measuring devices employed. All mass and dimensional measuring devices are calibrated according to ASTM standards. The test equipment is calibrated with standards traceable to NIST.

Arthur R. Wolfe
Vice President

REPORT - 011
FRP Laminate Analysis
Sample #012
Vessel: S/V Cynthia Woods
Laminate Ply-by-Ply Analysis
(hole saw cutout received)

Report No. 8015-160-012
Dated 27 Aug 08

Outer Surface

<table>
<thead>
<tr>
<th>Ply</th>
<th>Material</th>
<th>Weight</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>WR</td>
<td>24.5 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>WR</td>
<td>23.6 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0/90 KN BX</td>
<td>- oz/yd²</td>
<td>(partial, ground down, repair?)</td>
</tr>
<tr>
<td>4</td>
<td>CS</td>
<td>0.4 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0/90 KN BX</td>
<td>15.9 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>CS</td>
<td>0.7 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>0/90 KN BX</td>
<td>18.6 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>CS</td>
<td>0.7 oz/ft²</td>
<td></td>
</tr>
</tbody>
</table>

Average Thickness 0.230 in.

ASTM D 2584
Resin Content 56.0 % by weight
Reinforcement Content 44.0 % by weight

Notes: Values represent the results from 1 test specimen (ASTM D 2584), CS = chopped strand, KN BX = knitted biaxial, WR = woven roving

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Arthur R. Wolfe
Vice President

REPORT - 012
## FRP Laminate Analysis

**Sample #013**  
**Vessel: S/V Cyrilia Woods**  
**Laminate Ply-by-Ply Analysis**  

(hole saw cutout received)

### Approximate Weight

<table>
<thead>
<tr>
<th>Ply</th>
<th>Material</th>
<th>Weight</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CS</td>
<td>1.9 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>2+45</td>
<td>KN BX</td>
<td>12.4 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0/90 KN BX</td>
<td>-3 oz/yd²</td>
<td>Glass/Kevlar hybrid, estimated weight</td>
</tr>
<tr>
<td>4</td>
<td>CS</td>
<td>0.8 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0/90 KN BX</td>
<td>25.3 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>CS</td>
<td>0.8 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>7+45</td>
<td>KN BX</td>
<td>11.6 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>CS</td>
<td>0.9 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>9+45</td>
<td>KN BX</td>
<td>12.3 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>CS</td>
<td>1.2 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>11+45</td>
<td>KN BX</td>
<td>12.3 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>CS</td>
<td>0.9 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>0/90 KN BX</td>
<td>25.2 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>CS</td>
<td>1.0 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>0/90 KN BX</td>
<td>23.9 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>CS</td>
<td>0.5 oz/ft²</td>
<td>partial ply</td>
</tr>
<tr>
<td>17</td>
<td>0/90 KN BX</td>
<td>- oz/yd²</td>
<td>partial ply</td>
</tr>
<tr>
<td>18</td>
<td>CS</td>
<td>- oz/ft²</td>
<td>partial ply</td>
</tr>
<tr>
<td>19</td>
<td>0/90 KN BX</td>
<td>- oz/yd²</td>
<td>partial ply</td>
</tr>
<tr>
<td>20</td>
<td>CS</td>
<td>- oz/ft²</td>
<td>partial ply</td>
</tr>
<tr>
<td>21</td>
<td>0/90 KN BX</td>
<td>- oz/yd²</td>
<td>partial ply</td>
</tr>
<tr>
<td>22</td>
<td>CS</td>
<td>1.5 oz/ft²</td>
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</tr>
<tr>
<td>23</td>
<td>0/90 KN BX</td>
<td>24.5 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>CS</td>
<td>2 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>0/90 KN BX</td>
<td>24.8 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>CS</td>
<td>1.4 oz/ft²</td>
<td></td>
</tr>
</tbody>
</table>

### Inner Surface

- - - (white paint = 2 mils)

### Average Thickness

0.745 in.

### ASTM D 2584

- Resin Content: 53.7 % by weight
- Reinforcement Content: 46.3 % by weight

### Notes

Values represent the results from 1 test specimen (ASTM D 2584).
CS = chopped strand, KN BX = knitted biaxial, WR = woven roving

I hereby certify that the test results contained in this report are true and accurate within the limits of the measuring devices employed. All mass and dimensional measuring devices are calibrated according to ASTM standards. The test equipment is calibrated with standards traceable to NIST.

[Signature]

Arthur R. Wolfe  
Vice President

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REPORT - 013
FRP Laminate Analysis

Sample #026

Vessel: S/V Cynthia Woods

Laminate Ply-by-Ply Analysis  (hole saw cutout received)

<table>
<thead>
<tr>
<th>Ply</th>
<th>Material</th>
<th>Weight</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>+/-45 KN BX</td>
<td>oz/yd²</td>
<td>(partial, damaged by removal of material above)</td>
</tr>
<tr>
<td>2</td>
<td>0/90 KN BX</td>
<td>~ 18 oz/yd²</td>
<td>(Glass/Kevlar hybrid, estimated weight)</td>
</tr>
<tr>
<td>3</td>
<td>CS</td>
<td>1.0 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>0/90 KN BX</td>
<td>27.2 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>CS</td>
<td>1.3 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>0/90 KN BX</td>
<td>24.1 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>CS</td>
<td>0.6 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>0/90 KN BX</td>
<td>25.4 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>CS</td>
<td>1.0 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>+/-45 KN BX</td>
<td>11.4 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>CS</td>
<td>0.9 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>+/-45 KN BX</td>
<td>12.8 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>CS</td>
<td>0.9 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>+/-45 KN BX</td>
<td>12.8 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>CS</td>
<td>0.7 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>0/90 KN BX</td>
<td>26.2 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>CS</td>
<td>0.8 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>0/90 KN BX</td>
<td>24.4 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>CS</td>
<td>1.7 oz/ft²</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>0/90 KN BX</td>
<td>26.5 oz/yd²</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>CS</td>
<td>1.2 oz/ft²</td>
<td></td>
</tr>
</tbody>
</table>

Inner Surface  -  (glass/resin/glass/resin exterior surface)

Average Thickness  0.679 in.

ASTM D 2584
- Resin Content  55.2 % by weight
- Reinforcement Content  44.8 % by weight

Notes: Values represent the results from 1 test specimen (ASTM D 2584)
CS = chopped strand, KN BX = knitted biaxial, WR = woven roving

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Arthur R. Wolfe
Vice President

REPORT - 026
**FRP Laminate Analysis**

Sample #027  
**Vessel:** S/V Cynthia Woods  
**Laminate Ply-by-Ply Analysis**  
(hole saw cutout received)

<table>
<thead>
<tr>
<th>Ply</th>
<th>Material</th>
<th>Weight</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>CS</td>
<td>1.2 oz/ft&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>+/45 KN BX</td>
<td>14.0 oz/yd&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0/90 KN BX</td>
<td>~18 oz/yd&lt;sup&gt;2&lt;/sup&gt;</td>
<td>Glass/Kevlar hybrid, estimated weight</td>
</tr>
<tr>
<td>4</td>
<td>CS</td>
<td>1.0 oz/ft&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0/90 KN BX</td>
<td>27.7 oz/yd&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>CS</td>
<td>0.8 oz/ft&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>0/90 KN BX</td>
<td>26.7 oz/yd&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>CS</td>
<td>0.9 oz/ft&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>0/90 KN BX</td>
<td>25.8 oz/yd&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>CS</td>
<td>1.0 oz/ft&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>+/45 KN BX</td>
<td>10.3 oz/yd&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>CS</td>
<td>0.9 oz/ft&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>+/45 KN BX</td>
<td>12.5 oz/yd&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>CS</td>
<td>0.9 oz/ft&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>+/45 KN BX</td>
<td>12.8 oz/yd&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>CS</td>
<td>0.7 oz/ft&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>0/90 KN BX</td>
<td>25.4 oz/yd&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>CS</td>
<td>1.0 oz/ft&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>0/90 KN BX</td>
<td>22.3 oz/yd&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>CS</td>
<td>1.4 oz/ft&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>0/90 KN BX</td>
<td>- oz/yd&lt;sup&gt;2&lt;/sup&gt;</td>
<td>(special ply)</td>
</tr>
<tr>
<td>22</td>
<td>CS</td>
<td>0.7 oz/ft&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>0/90 KN BX</td>
<td>28.2 oz/yd&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>CS</td>
<td>1.5 oz/ft&lt;sup&gt;2&lt;/sup&gt;</td>
<td></td>
</tr>
</tbody>
</table>

**Inner Surface**  
- -  
(white gel 6-20 min)

**Average Thickness**  
0.667 in.

**ASTM D 2584**  
- **Resin Content**: 53.8 % by weight  
- **Reinforcement Content**: 46.2 % by weight

**Notes:**  
Values represent the results from 1 test specimen (ASTM D 2584).  
CS = chopped strand, KN BX = knitted biaxial, WR = woven roving

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Arthur R. Wolfe  
Vice President

REPORT - 027