Lessons Learned from Sailing Incidents 2011-2015

Chuck Hawley Stan Honey Sally Honey Brian Adams Betty Sherman Bruce Brown



2011 Severn Sailing Association - Olivia Constants 2011 Chicago/Mac Race - Wing Nuts 2011 Fastnet - Rambler 100 Capsize 2012 Crewed Farallones Island Race - Low Speed Chase 2012 Newport to Ensenada Race - Aegean 2013 Islands Race - Uncontrollable Urge 2013 34th America's Cup - Artemis 2014 Volvo Ocean Race - Team Vestas Wind 2015 Dauphin Island Race - still under USCG review 2006 Regatta de Amigos - Cynthia Woods 2014 Return from Caribbean - Cheeki Rafiki 2015 Delivery - Polina Star III





Olivia Constants, June 20, 2011 Severn Sailing Association Annapolis, MD





Sequence of Events

- Jibe, knockdown, capsize, followed quickly by safety boats
- Olivia accidentally connecter her trap harness
- Difficulty disconnecting Olivia from gear
- Three minute immersion
- CPR started very soon thereafter
- Ambulance arrived quickly

- Investigate ways to reduce the likelihood of capsize
- Test life jackets for appropriateness for dinghy sailing
- Identify risks and training required for use of trapezes
- Identify best means of dealing with capsize/entrapment
- Identify best means of communication, both electronic, texting and more conventional signaling
- Standardize the vocabulary of dealing with a crisis so that there are fewer miscommunications
- Model risk management procedures and create crisis plans for clubs and racing organizations

WingNuts, 2011 Chicago Mac Race



Course of the Chicago Mac Race

WingNuts,

0

Lake Huron

Milwaukee

Chicago

Image NOAA Image USDA Farm Service Agency

© 2011 Google 43°45'15.98" N 86°12'47.20" W elev 706 ft



Detroit

Eye alt 393.95 mi



Average High Wind Speed Reported



Knots of Wind

Wingnuts









The Capsize

- Storm accurately forecasted
- Crew wore personal safety gear, clipped in, reduced sail
- On Sunday 2300 CDT, a 65 knot "wall of wind" struck
- WingNuts was knocked down and continued to roll over until capsized
- Five crew on deck escaped to the surface
- One crew below decks escaped
- Mark Morley and Suzanne Makowski-Bickel suffered head injuries and drowned as a result

US Sailing





Bob Arzbaecher skipperBeneteau 40.7Sociable





First, a low whistle. "It heightened our sensitivity. We said, 'Let's keep our eyes open.'"



Then a dim light in the waves. "A needle in the haystack, maybe a quarter mile away."

They found and rescued 6 holding onto a capsized boat, *WingNuts*.

"A life jacket, a whistle and a light. My God, how simple it can be? But that's what it was."

Search and Rescue

- >Each Crew owned a responsibility
- Separated radio communications from rescue activities
- >Use of Lifesling was key
- Assumed command of the search for missing crew
- Needed to press survivors for more information
- Coordination of other boats
- Keep emotions in check

United States Coast Guard

- Response times
- Capabilities, swimmers vs. divers
- Weather effects response
- Other vessels in the area
 - Control Communications and Search

>Taking care of survivors

- First Aid
- Hypothermia
- Mental state

Crew Debrief / Media Circus

Completing the Rescue

- Taking care of survivors
 - First Aid
 - Hypothermia
 - Mental state
- Crew Debrief / Media Circus

- Overall
 - Race organizers should be circumspect about the boats they invite to race. Safety has to be the primary concern.
- Selection
 - Race organizers should impose a minimum specification on the crew and a minimum specification for the boat
 - Race organizers, when needed, should engage the services of a Naval Architect to help in technical issues
 - Race organizers should specify a minimum Stability Index

- Stability
 - US SAILING should consider redefining or recalculating Stability Index so that it more accurately represents the boat's ability to resist or recover from a knockdown or capsize.

- Safety Regulations
 - The Safety at Sea Committee of US SAILING should consider rewriting the ISAF OSRs to improve comprehension, compliance, and ubiquity, using the MSRs as an example
 - The Safety at Sea Committee should conduct a study of different tether/life jacket/harness designs to determine if an optimum combination of security and ease of release can be found.

- Training
 - US SAILING SASC should incorporate the lessons learned from this incident into the SAS seminars in these areas
 - The possible difficulty in release a tether from a life jacket/harness combination when the life jacket is inflated
 - Stability and seaworthiness
 - Coast Guard roles, assets, and response times
 - Better understanding of NWS terms for intense storms

RAMBLER 100







With keel





1717 BST: Rambler 100 Rounds Fastnet Rock

- F= 2100

1740: Last known (upright) photo

Rambler 100 Track



US Sailing

1946: RNLI Lifeboat begins evacuation





1946: Wave Cheiftan responds to call 2031: Wave Cheiftan spots and retrieves 5 crewmembers

TRAINING

Start teaching MAYDAY

- 1. Push DSC Button
- 2. Give Voice Call, and
- 3. Activate GRIRB.
- Require ISAF Personal Survival Course attendance for all US Cat 1 and 2 races.

Splashguard/Sprayhood



- Personal Safety Equipment
 - Encourage USCG acceptance of ISO Standards
 - Require a selection switch between Auto and Manual Inflation in all inflatables
 - Add 'when reefed' to mandatory times to wear PFD's

Low Speed Chase Incident Crewed Farallones Race April 14, 2012



April 14, 2012

A normal lively sailing day -

- turned tragic


Synopsis of Events

- LSC sailed course over 4-fathom shoal in 28' depth
- Encountered breaking waves when < 0.2 nm (400 yards) from NW point
- Significant wave forecast wind waves of 7' on swell of 15'
- Set of larger than average waves capsized boat
- 7 crew thrown into water, 1 stayed on board
- 5 of 7 in water drowned

Failure of seamanship in negotiating shoal waters on a lee shore was the only direct cause

Maintop Island rocky ledge extends northwards about 200 yards from shore marked on the chart by a dotted line and "Breakers" (breaks continuously) shoal extends another 275 yards northwards to the 6-fathom curve charted depths of 4_3 fathoms (27')





Findings

1. Failure of seamanship in negotiating shoal waters on a lee shore was the only direct cause

2. Inadequate personal safety gear in use for offshore conditions, could have saved lives

3. Limited VHF communication infrastructure hampering race committee-to-race boat communications

4. Race management protocol flaws created uncertainty surrounding search and rescue efforts

Lee Shore and Breaking Waves



What Depth is Safe for forecast 15' swell + 7' wind-wave?

3 ways to calculate Safe Depth from Wave Height Predictions:

- 1. Cosmic: Depth = SqRt (Swell²+ Wind-Wave²) x 2 x 1.3 > 43'
- 2. Stan Honey: Depth = 2.5 x (Swell + Wind-Wave) > 55'
- 3. MaxEbb: Depth = 3 x Swell (or 4 x Swell) > 45-60'

Inadequate personal safety gear in use for offshore conditions, could have saved lives

- Racers required to "have" lifejackets to meet US SAILING 5.0.1, but only wear "adequate" flotation
- Category 2 requirements not met by two crew
- Of crew in water, those wearing 5.0.1 life jackets survived, none had thigh straps
- Jacklines deployed per requirement, not used

What Type of Life Jacket?



Inshore



Inshore



Offshore

US Sailing

Lost At Sea -



Alan Cahill



Alexis Busch

Marc Kasanin





Elmer Morrissey

Cold Water Shock, 51° : reflex gasp, rapid breathing, no breath-holding. Survivors wore PFDs that met US Sailing 5.0.1, but no thigh straps > fight to breathe Jacklines deployed, but NO TETHERS USED 5 of 7 in the water were lost; one on boat survived.

Stand Down in Gulf of the Farallones



April 26th Stand-Down restricts offshore races to line from Mt. Bonita to Land's End "San Francisco offshore sailboat racing organizations need to review racing safety protocols and seek improvement"

US Sailing

Recommendations from LSC Tragedy

- 1 Annual Training to improve seamanship, specifically on breaking wave development
- 2 Require personal flotation to meet USS prescription 5.0.1, training in jackline rigging and use, spot inspections to ensure MER compliance.
- 3 Improve VHF communication infrastructure
- 4 Improve race management accountability of boats and crew on the race course.
- 5 Regular training of RC personnel to include offshore events and USCG requirements.

Seminars Scheduled for 2013

- Feb 23, NorCal ORC, Race management meeting, OAs & PROs
- Feb 24, Full-day SAS at CMA with Coastal Focus
- March, in-water sessions at SFYC
- April 14, Half-day Coastal SAS Seminar, Strictly Sail
- May 19, Full-day SAS with PacCup focus, CMA
- June 23, Half-day Pacific Offshore Academy, RYC
- October 19, Half-day Pacific Offshore Academy, RYC

Aegean Incident Newport-Ensenada Race April 28, 2012

2012 Newport-Ensenada Yacht Race

- 125 mile annual race
- 213 starters, 1100 start time, 27 April
- Safety: PHRF Cat 2, 19 items
- Cruising class allows motoring
- Very light conditions prevailed
- Moonset was 0054





Newport to Ensenada YACHT RACE

Aegean

- Experienced crew
- Full electronics package including radar, GPS, autopilot
- SPOT Connect
- Elected to use powering option starting around 2130 PDT







A needle in a haystack

US Sailing

SEND Devices

- <u>Satellite</u> <u>Emergency</u> <u>Notification</u> <u>Devices</u>
- Receive GPS data to create position fix
- Transmit that info to preprogramed recipients
- Some units have text capacity for messaging
- SEND units require a subscription
- EMERGENCY transmissions are not received by USCG but by a private contracted agency.

SPOT CONNECT

- SEND device
- Tracking, simple messages, 911
- Private company, not the Coast Guard
- Last text transmission sent 1949 PDT
- Last position report sent at 0136 PDT
- 911 message sent at 0143 PDT
- No MAYDAY, no distress call.



Spot Connect track of Aegean as she powered south



SPOT CONNECT track overlayed on chart showing area of obscured light



Timeline

0141 Impacted the island, acc'd to extension of track line 0143 911 message transmitted 0146, 0147 GEOS called skipper's wife; left message 0700 Debris discovered by race participant 0901 Skipper's wife called race committee; left message 0925 Message received; relayed message to RC in MX 1000 *Shockwave* notified CG of potential accident 1042 Two bodies discovered south of North Coronado Island 1100 Message relayed to PRO 1114 Skipper's wife contacted to confirm information 1220 NOSA contacts Sector San Diego

Coast Guard aerial photo, 1 May 2012



Photo by John Walton, 7 May 2012



Underwater photo, XPLORE OFFSHORE, August 2012



Floating debris collected by CG





Recommendations from the Panel

- Keep a good lookout
 - Visibility
- Navigation
 - Pre race seminars
 - How to view obstructions/hazards
 - Share basic workings of nav systems

- Encourage continued safety training
- Sailors monitor VHF 16 at all times
- Understand differences
 in signal devices
- Race organizers available contacts
- Race organizers Emergency or Crisis Plan

Uncontrollable Urge Islands Race April, 2013



Uncontrollable Urge

- 2013 Islands Race
- Columbia Carbon 32'
- History of rudder failure
- Six man crew
- Winds 25-30 knots, large seas



38022_1 (Zoom = 2x)

Chart 18022_1 Scale = 1:868,003 Depth in Fathoms San Diego to San Francisco Bay

MAG

484.7

915 324 712 ants Monorb 925 492 Ranin 361 s 00A5 '48029 818 40 Y 20to PM AERO. Ret W&O 643 Beech 417.0 TO HOME 1035 141 385----331 117 A THE \$20 963 235 ana: Desch 235 FI 10k 765 and test 1.68 172 DUMP SITE 125 Date mark 52 \$1.44 221 146 722 5hd 836 Br 292.721 285 的海道 APC A. T 0,00 350 # 725 244 FI 10s 631 16M CAUDON San Oonfre M ina We C) 275 663 C MOX 2128 HOM PA 18 the SCH TH 144 -29 CHART 18746 667 400 16.3 493 33 199 637 267-647 \$22 63 41 534 68 152 Bn 323 27.7 446 45 TH * 652 607 277 4ki 459 M5 434 543 800 572 GULF OF SANTA CATALINA 239 £74 \$55 211 44 *0 201 140 380 426 240 - 10 34 633 511 308 453 2 050MD 462 FI 5a 2029 215 364 312 744. 60 718 1254 539-O 58 945 484 Jall 317 248 San Nicholas Basin 434 AREA 40h TM 827 567 615 625 540 860 815 OCAL-MAGNET D320 05 400 TUPPRANCE 600 717 155 м 130 05 950 866 875 514 San Clemente Scile. 25 FI 106 2288 188 724 1.4 15/11/5 523 136 a 300 135 1526. 364 10 293 (KEDO) 1 6 11.54 572 16,65 .597 790 540 307 406 228 228 875 608 .410 OR ai 563 280 Tanner Bank A Ret WAG 部計 337 58 621 767 635 ٢ 4.25 3.14 56 336 339 112 307 786 C'M 643 **Dha** 657 300 284 2703 667 de 637 032 Sun Clements 929 770 27 672 592 574 10:0 Cortes Bank 614 651 673 606 253 AFEA 172 643 Bishop 2.76 742 560 2.65 500 Rock 439 236 725 46 685 606 605 54 mm 1.1 2)(2) 122 413

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HODER !!

Cascading Issues

- Rudder failed
- No back-up rudder
- Poor communication between navigator and crew
- Did not request assistance from CG or fleet
 - Some boats did not respond to radio calls
- Anchors failed to hold boat
- Rolled in the surf
- Loss of one crew due to drowning



UU Conclusions

- Take better boats to sea
- Have safety equipment to solve steering problems
- Call for help before safety is further compromised
- Respond to emergency calls even if you're not able to help
- Track your progress so you know how much time you have

Artemis 34th America's Cup April, 2013

Artemis


They weren't supposed to foil...



Shallow draft, upwind hull



www.cupinfo.com

C shape tucks under hull



www.cupinfo.com

Automatically reduces lift



www.cupinfo.com

To summarize...

- Boats were sailing 5-10 knots faster than anticipated
- Opted for too large of a wing for the conditions
- Used hard boats not soft marks for turning marks
- Restricted the controls that would have stabilized the boats when foiling
- Sold the 12th man position to sponsors, celebrities, Coast Guard Captains

Oracle Team USA Capsize



May 9, 2013 Layers of broken boat



How do you search for the missing sailor?



The part that capsized...



Safety Panel Recommendations

- Inter-team coordination between safety boats
- Two divers on safety boats
- EMS meeting locations based on accident site
- Numbers on crew uniforms and helmets
- Improved rudder elevator designs
- Limits and pre-start maneuvers to reduce capsize
- Wind speed limits for LV RR, LV Final, AC

Safety Panel Recommendations

- Improved body armor and flotation for the crews
- Improved Spare Air solutions
- SONAR system to find missing sailors
 - Clicker system to ID missing sailors
 - LED lights for sailors
- No 12th man positions
- No hard marks

Vestas Wind Volvo Ocean Race November 29, 2014

Volvo Ocean Race 2014-2015

- 10 Leg, 39,000 mile race
- 8 crew plus a media professional
- 65' One-Design boats
- Hazardous courses





New Route for 2013-2014 Race



Rivière du Rempart Port Louis Plaines Wilhems Black River Savanne



Data SIO, NOAA, U.S. Navy, NGA, GEBCO © 2015 Google







C-MAP Chart of Same Area



C-MAP Chart, zoomed in









It's pretty simple.

- Navigator, skipper, and crew were completely unaware of the reef/islands.
- No perceived need to monitor radar or depth.
 - Paper charts and Sailing Directions were not consulted during planning or race.
- The reef/islands were accurately located in C-MAP chart data but:
 - representation was ineffective at small scales
 - charts were not installed on the routing computer

Dauphin Island Race, 2015

- Organized by Fairhope YC
- 117 boats from 16' to 40'
- 17.7nm course length
- Thunderstorms forecast several days in advance
- Delayed start by 90 min to 11:00am
- Storm hit very quickly after 3:00pm
- Winds of up to 75mph
- Five boats sunk; ten "damaged"
- Six fatalities (not all of whom might have been in race)

How do we learn about extreme weather events?

- GoPro cameras and smart phones!
- 16 minute video by Joshua Edwards
 - Catalina 36 Sailboat returning from the finish
 - Claimed to have "300 years of sailing experience"

2:43 Passes boat out of control



6:02 Gets Type II out of cockpit locker



6:29 Life ring shows amount of breeze



10:06 Skipper gets a life jacket



10:10 Skipper loses life jacket





Father and Daughter's Friend: H16





From Sailing Anarchy

...we...proceeded to...FYC when we spotted three sailors floating, we rescued them and had learned they were sailing a Cal 24 that turtled and sank. They were in the water for more then an hour and were in shock as they lost 2 crew to drowning. We got them safely back to FYC.

The sailors we rescued yesterday were all wearing PFDs, they stated that the two victims were also wearing PFDs. The chop on the bay was so incredibly steep that it may have contributed to them drowning as the water was constantly breaking over their heads. Ironically one overboard sailor survived a three hour ordeal without a PFD. I'm not advocating against wearing life jackets I'm just telling you what I know that happened yesterday.

What are the common themes? What conclusions can we draw?

Vessel	Deaths	Stability?	Life Jackets?	Navigation?	"Hi Tech" Design?
420	1	Х	Х		
WingNuts	2	Х	Х		Х
Rambler 100	0	Х	Х		Х
Low Speed Chase	5		Х	Х	
Aegean	4			Х	
Artemis	1	Х			Х
Uncontrollable Urge	1		Х	Х	Х
Vestas Wind	0			Х	Х
Dauphin Island	6	Х	X		
Total	20	5	6	4	5

us Saming

Additional Incidents of Interest

Beneteau 40.7 *Cheeki Rafiki* Cape Fear 38 *Cynthia Woods* Oyster 825 (90') *Polina Star III*
Beneteau 40.7 Cheeki Rafiki



MAIB Report

- The bond between a floor grid and hull can break without detection.
- Light groundings can damage internal structural (grid or matrix) bonds
- Inspection of hull-keel joint can provide warning of failure
- Avoid storms at sea
- Leaks can come from the hull-keel joint
- Post inversion, you have to be able to get the raft

Cape Fear 38 Cynthia Woods June 6, 2006



Cape Fear 38 Cynthia Woods June 6, 2006

- Different reports put the responsibility on different parties
- Multiple causes:
 - Inadequate hull thickness
 - Hull thickness: 0.52 to 0.56", keel bolt 1.50"
 - Small backing plates on keel bolts; sharp edges
 - Groundings without post-incident inspection
 - Inadequate repairs to damage after groundings
- Disputed by Dobroth Design Science report







Oyster 825 Polina Star III



Oyster 825, Polina Star III

- Keel fell off in about 18 knots of breeze on a delivery over about 6 minutes.
- Hull stayed afloat until next day; both hull and keel recovered.
- Boat was an 82', modified by Oyster to 90'
- Keel attachment was unlike other Oyster designs
- Seven boats made similar to this one.





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Rambler 100	0	Х	Х		Х
Low Speed Chase	5		Х	Х	
Aegean	4			Х	
Artemis	1	Х			Х
Uncontrollable Urge	1		Х	Х	Х
Vestas Wind	0			Х	Х
Dauphin Island	6	Х	Х		
Cheeki Rafiki	4	Х		Х	
Cynthia Woods	1	Х	Х		
Polina Star III	0	Х			
Total	25	8	7	5	5

Post-Accident Investigations

- Survey the fleet to get a broad range of opinions
- Honest assessment of what worked and what didn't
- Interview the Organizing Authority to see what practices were followed
- Suggest changes to avoid a repeat
 - •Training
 - •Equipment
 - Vessel requirements
 - •Crew expertise