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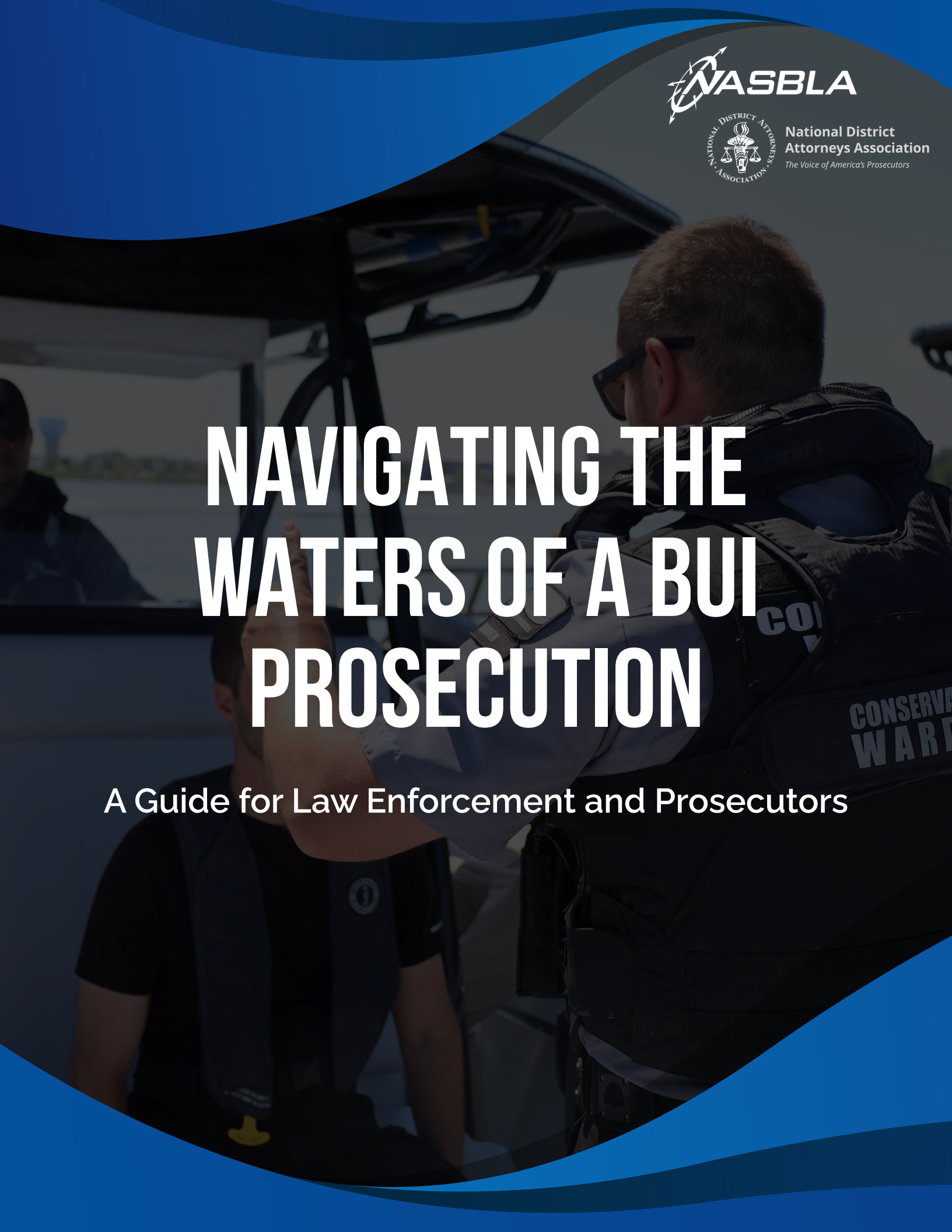

NAVIGATING THE WATERS OF A BUI PROSECUTION

A Guide for Law Enforcement and Prosecutors

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NATIONAL TRAFFIC LAW CENTER

The National District Attorneys Association's National Traffic Law Center (NTLC) is a resource designed to benefit prosecutors, law enforcement, judges, and criminal justice professionals. The mission of the NTLC is to improve the quality of justice in traffic safety adjudications by increasing the awareness of highway safety issues through the compilation, creation and dissemination of legal and technical information and by providing training and reference services.

When prosecutors deal with challenges to the use of breath test instruments, blood tests, horizontal gaze nystagmus, crash reconstruction, and other evidence, the NTLC can assist with technical and case law research. Likewise, when faced with inquiries from traffic safety professionals about keeping our roadways safe, the NTLC can provide research concerning the effectiveness of administrative license revocation, ignition interlock systems, sobriety checkpoints, and much more.

The NTLC has a clearinghouse of resources including case law, research studies, training materials, trial documents, and a directory of expert professionals who work in fields such as crash reconstruction, toxicology, and drug recognition. The information catalogued by the NTLC covers a wide range of topics with emphasis on impaired driving and vehicular homicide issues.

The NTLC is a program of the National District Attorneys Association (NDAA). NDAA's mission is to be the voice of America's prosecutors and to support their efforts to protect the rights and safety of the people.

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NATIONAL ASSOCIATION OF STATE BOATING LAW ADMINISTRATORS

The National Association of State Boating Law Administrators (NASBLA) is a nonprofit organization dedicated to advancing recreational boating safety across the United States. Its mission is to support state and territorial boating authorities in reducing boating-related fatalities, injuries, and property damage. NASBLA fulfills this mission through advocacy, professional training, and the development of model laws and policies that guide effective enforcement and education efforts.

One of NASBLA's initiatives is the Boating Under the Influence (BUI) Program, which aims to reduce impairment-related boating incidents and fatalities. This program offers specialized training courses in BUI detection and enforcement, equipping law enforcement officers with the skills necessary to identify and manage intoxicated boat operators. By enhancing officers' capabilities, NASBLA promotes safer waterways and helps prevent avoidable tragedies.

Complementing the BUI Program is Operation Dry Water (ODW), a nationwide awareness and enforcement campaign launched by NASBLA in partnership with the U.S. Coast Guard. ODW operates year-round, with a heightened enforcement period each summer when officers from across the country collaborate to raise awareness about the dangers of boating under the influence. Given that alcohol impairment is a factor in approximately 25 percent of all boating fatalities, this campaign plays a critical role in educating both operators and passengers about the risks of impairment — on the water and on the road.

NASBLA works with all U.S. states and territories to collect and analyze boating safety data, which informs policy development and public outreach efforts. For more information about NASBLA's programs, resources, and boating safety statistics, visit www.NASBLA.org. Details about BUI laws in each state and territory, as well as registration and media resources for Operation Dry Water, are available at the campaign's website: www.operationdrywater.org.

PREFACE

Boating under the influence (BUI) enforcement is more than a legal responsibility — it is a mission that saves lives. Prosecutors and law enforcement officers play a critical role in enforcing boating safety laws designed to prevent loss of life, injury, and property damage. By investigating and prosecuting BUI cases with the same diligence applied to DUI offenses, you help deter dangerous behavior, shape public attitudes, and protect families from the devastating consequences of impaired boating.

This guide is designed to support your efforts and serve as a practical resource in your pursuit of justice and safety. Your dedication makes a difference.

Thank you for standing at the forefront of this essential work and for helping keep our waterways safe for all.

Thomas E. Guess
Chief Executive Officer
National Association of State Boating Law Administrators

INTRODUCTION

When a victim is struck by an impaired operator the consequences are devastating. It is equally devastating whether the crash occurred by an impaired boat operator or an impaired motor vehicle driver. Yet, in many states across the country, boating under the influence (BUI) is not treated with the same legal seriousness as driving under the influence (DUI). This disparity persists despite the clear and tragic evidence that impairment on the water is just as dangerous as impairment on the road.

Consider the case of Alex Otte, now a Regional Executive Director at Mothers Against Drunk Driving (MADD).[1] At just 13 years old, Alex was nearly killed by a drunk boater. On July 2, 2010, while riding jet skis with her family on a lake in Kentucky, she was struck by a bass fishing boat traveling over 60 mph. The impact left her with a severe brain injury, a broken neck and collarbone, a shattered jaw, a lacerated liver, two shattered femurs, and the loss of her right leg below the knee.[2] She was not expected to survive. After spending weeks in the hospital, Alex subsequently underwent one surgery each year for 11 years and continues to live with the lifelong consequences of that.[3]

The boat operator who hit her was nearly twice the legal limit of 0.08 BAC and for the BUI alone, ultimately received a $250 fine.[4] At the time, and still today in Kentucky, a first-time BUI offense carries a penalty of $200–$250 or 24 hours imprisonment.[5] In contrast, a first-time DUI offense in Kentucky involving a motor vehicle could result in $200–$500 in fines, 48 hours to 30 days in jail, and a four to six month license suspension.[6] This disparity is not unique to Kentucky. For example, in Oklahoma a first-time DUI offender faces up to $1,000 in fines and 10 days to one year in jail[7] versus a maximum fine of up to $1,000 alone for a first-time BUI.[8] [9] And while some states link DUI penalties and license revocation to watercraft operation, Kentucky and many other states do not.[10] [11] Also, in many states, there are no open container laws for boats.[12]

[1, 3] A. Otte, personal communication, August 13, 2025.
[2] MADD Announces New National President - MADD.
[4] Fight against drunk driving stems from her own trauma | Lexington Herald Leader, Ahead of holiday, teen nearly killed by drunk boater shares story | kare11.com, Woman injured by drunken boater advocates for stricter laws.
[5] KRS § 235.990(2).
[6] KRS § 189A.010(5)(a), KRS § 189A.070(1)(a)2.
[7] 47 Okl.St.Ann. § 11-902C.1.
[8] 63 Okl.St.Ann. § 4210.8C.1.
[9] See also Vermont: first-time DUI offense carries a maximum fine of $750, a maximum two years of imprisonment or both vs a first-time BUI offense which carries a fine of $200-$750 and a maximum one-year imprisonment. 23 V.S.A. § 1210(b), 23 V.S.A. § 3317(e).
[10] Ky. Driving Under the Influence Law § 1:28 (2024-2025 ed.) Kentucky Handbook Series, Driving Under the Influence Law | November 2024 Update, Joseph B. Suhre and Wilbur M. Zevely.
[11] Boating Under the Influence. State Boating Laws. (n.d.). https://www.uscgboating.org/regulations/state-boating-laws-details.php?id=27&amp%3Btitle
[12] See e.g. MN: Minnesota Boating Guide 2025; TX: TPWD:Frequently Asked Questions About Boat Laws; ID: Boating | Department of Parks and Recreation.

INTRODUCTION

Photo Credit: NASBLA Public Library

Why does this disparity persist when the dangers of impaired operation are equally lethal on water and land? The answer lies, in part, with cultural attitudes. Recreational boating is often seen as a carefree activity, synonymous with leisure, celebration, and alcohol. The public has largely embraced this "fun in the sun" mindset, where coolers full of alcohol are common sights on boats. Now, with recreational cannabis legalized across much of the United States, its use on the water is also becoming more widespread.[13] [14] Despite the relaxed atmosphere, the reality remains: impairment — whether from alcohol or cannabis — poses serious risks. The behavior may be normalized, but it is undeniably dangerous.

The behavior is especially dangerous, given the unique risks of the boating environment — where activities like floating, swimming, and tubing are common. These conditions can place individuals, especially children, in vulnerable situations, making impaired judgment while operating a boat even more dangerous. In fact, according to the 2024 U.S. Coast Guard Recreational Boating Statistics, alcohol impairment is the leading contributing factor in boating fatalities.[15] [16]

Photo Credit: NASBLA Public Library

Impaired boating presents a serious threat to public safety. By pursuing accountability for those who choose to operate vessels under the influence, prosecutors and law enforcement can help prevent tragedies and safeguard their communities. Thorough investigations and effective prosecutions of BUI cases are essential to protecting the public, and this monograph is intended to support them in fulfilling that mission.

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[13] Cannabis Dispensary Grand Opening | Smokehouse | Fox Lake, IL"One of the standout features of our new location is the convenience of boat-friendly access. We wanted to create an experience that goes beyond the typical dispensary visit, perfectly complementing the scenic beauty of Fox Lake. Customers can easily dock their boats, pop in to pick up their orders, and be back on the water in no time. It's all about quick, hassle-free shopping that fits right into the lakeside lifestyle Fox Lake is known for."

[14] It should be noted, while cannabis has been legalized in many states, it is still illegal per federal law and thus, illegal to possess on waters subject to federal jurisdiction where authorities may board a vessel for inspection at any time. See 21 U.S.C.A. § 812, 14 U.S.C.A. § 522.

[15] 2024 Recreational Boating Statistics.

[16] In addition to state civil and criminal penalties, the Coast Guard (CG) has jurisdiction to prosecute any CG licensed or credentialed mariner in an administrative hearing to act against the CG-issued license. State prosecutors should know their CG and CGIS counterparts for these situations.

KEY DIFFERENCES BETWEEN DUI AND BUI THAT PROSECUTORS SHOULD UNDERSTAND

Prosecutors handling BUI cases should be aware that law enforcement officers operating in the marine environment face unique safety and investigative challenges that differ significantly from those encountered during roadside DUI stops. The maritime setting introduces complexities that can directly affect the conduct and outcome of an investigation, including the following:

- Limited working space: Officers are confined to the dimensions of the vessel, which restricts movement and positioning during interactions with suspects.
- Lack of cover and backup: Unlike land-based patrols, waterborne units often operate alone or with limited support, increasing vulnerability during enforcement actions.
- Environmental conditions: Heat, cold, wind, waves, and visibility can all impact an officer's ability to observe, communicate, and safely manage the situation.

Photo Credit: Georgia Department of Natural Resources Law Enforcement Division

These factors are not just operational concerns — they can influence the quality and admissibility of evidence, the timing of field sobriety tests, and the officer's ability to articulate observations in court. For example, a suspect's unsteady behavior may be due to wave action rather than intoxication, and delays in chemical testing due to distance from shore may affect BAC readings. Prosecutors should understand that officers must balance investigative priorities with safety protocols, and that the nature of the marine environment may necessitate deviations from standard DUI procedures. These deviations may not indicate poor practice but rather reflect the realities of enforcing the law on the water.

When evaluating BUI cases, it's important to consider how environmental factors may have shaped the officer's decisions, timing, and observations — and to be prepared to explain these nuances to judges and juries unfamiliar with maritime enforcement.

The following are key characteristics unique to BUI investigations, and important considerations for prosecutors handling these cases:

Water Is Multidimensional

Unlike roads, which are linear and bounded by lanes and curbs, waterways are open

and multidirectional. Boats can move forward, backward, turn laterally, pitch up or down, and roll side to side. Environmental factors such as wind and current further influence vessel movement. This complexity makes it difficult to observe classic DUI indicators like "failure to maintain lane" or weaving. Instead, officers must rely on more subjective cues that can be more vulnerable to legal scrutiny, such as:

- Erratic speed changes
- Inconsistent navigation
- Improper use of navigation lights

Waterways Have No Standard Speed Limits (Except Wake Zones)

On land, speed limits are clearly posted and legally defined. Outside of designated no-wake zones, there are typically no posted speed limits. This makes it difficult to justify a stop based solely on speed. Officers, therefore, typically rely on behavioral or navigational errors to establish reasonable suspicion or probable cause.

There Is an Absence of Traffic Control Devices

Waterways lack the familiar traffic control features found on roads — no stop signs, traffic lights, or lane markers. Navigation rules exist, but they are based on seamanship and courtesy and are not visibly posted. Imagine, for example, driving through a town with no lanes, no designated direction of travel, no traffic signals, and no speed limits. Now picture doing this at night, where your only visual cues are dim red, green, and white navigation lights — often weaker than a discount flashlight. In these environments, safety depends entirely on the knowledge, skill, and courtesy of other operators.

This absence of objective traffic violations means law enforcement officers must take great care in drafting their reports and testifying in such a way that prosecutors and others clearly understand how the observed behavior deviated from acceptable norms and, thus, supported reasonable suspicion for the stop.

Boats Cannot Stop on a Dime

Boats lack traditional braking systems. Instead, they slow down through water resistance and by reversing the propeller. Wind and current further reduce maneuverability, making precise control more difficult. As a result, stopping a vessel requires anticipation and strategic use of the engine. These mechanical limitations pose challenges during BUI investigations. Impaired behavior can be difficult to distinguish from normal vessel handling, as erratic movements may stem from environmental factors or the boat's inherent limitations. This overlap can mask or mimic signs of impairment, making it harder for officers to accurately identify intoxicated operators.

BUI Suspects Board Law Enforcement Vessels During Investigations

Unlike roadside stops, BUI investigations often occur in dynamic and, therefore, potentially hazardous environments. Officers must continuously monitor vessel stability, shifting weight distribution, and environmental conditions such as waves, wind, and visibility. The presence of alcohol heightens the risk of injury or falls overboard — for both the suspect and the officer. In these situations, safety gear, proper vessel positioning, and situational awareness are essential and may take precedence over investigative procedures.

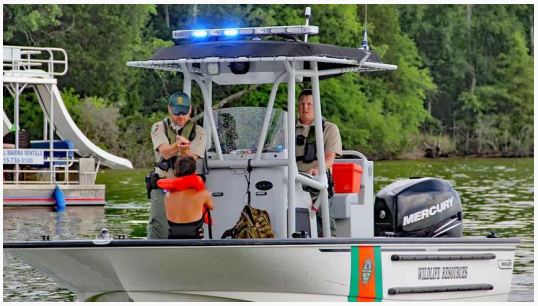

Photo Credit: Tennessee Wildlife Resources Agency

Because of these safety concerns, the BUI suspect is often brought aboard the law enforcement vessel for questioning or to perform field sobriety tests. BUI suspects must cross over to the officer's vessel, which can be a physically demanding task. Of note is the fact that some agencies have policies requiring all individuals aboard their vessels to wear personal flotation devices (PFDs). Importantly, the SFSTs can be administered while the subject is wearing a PFD, ensuring safety without compromising the integrity of the evaluation.

Bringing a suspect aboard the patrol vessel can blur legal boundaries related to custody and Miranda rights. Determining when a person is "in custody" on the water is not always straightforward. Transporting a suspect from their vessel to the law enforcement vessel may be interpreted as a form of detainment — even if not formally declared an arrest. This ambiguity can introduce potential legal defenses, particularly concerning self-incrimination and due process.

Once aboard, the suspect's movement is restricted, which may raise Fourth and Fifth Amendment concerns. Therefore, officers and prosecutors should examine these issues in the context of applicable state laws and case law to ensure that any statements or evidence obtained are legally admissible in court.

The Distance to Shore Can Mean Significant Delays in Testing

Law enforcement officers operating in marine environments may face significant delays in processing impaired operators after arrest due to their physical distance from shore. Because officers may be operating miles from shore, immediate access to breath or blood testing equipment is often unavailable. The time required to transport a suspect to land can result in delayed BAC testing and, thus, lower BAC levels than those which the suspects had while operating the boat. In some cases, this may mean the BAC levels have fallen below the per se legal threshold of 0.08.

In addition to breath testing, Drug Recognition Expert (DRE) evaluations may also be delayed, as they cannot be conducted on the water. Just like with alcohol, the longer the delay, the greater the risk that observable signs of drug impairment may be diminished. Similarly, levels of substances in toxicological evidence may also be lower, higher, or nonexistent.

These delays present strategic opportunities for defense attorneys, who may challenge the accuracy of test results or the credibility of an officer's observations. As such, prosecutors should be prepared to closely examine and address these timing issues when reviewing BUI cases, ensuring that investigative procedures and evidence collection are clearly documented and legally defensible.

UNDERSTANDING THE PHASES OF A BUI INVESTIGATION

As with DUI investigations, BUI investigations are divided into three distinct phases. Each phase involves specific tasks and decision points for the officer. These phases build upon one another, guiding law enforcement through a structured and methodical approach to identifying and documenting impairment on the water.

PHASE 1: VESSEL IN MOTION

The first task in Phase One is for officers to observe the vessel while it is in operation and identify any initial cues that may indicate a possible BUI violation. At this stage, the officer must determine whether there is sufficient cause to stop the vessel — either to investigate potential impairment or to address another boating violation. Importantly, this initial observation is not a commitment to arrest; rather, it is an opportunity to gather relevant evidence that may suggest impairment.

This first task begins when an officer initially notices a vessel, its operator, or both. This observation may be prompted by a variety of factors, including the following:

- A moving boating violation
- An equipment violation
- Expired registration or safety inspection decal
- Unusual or erratic operating behavior
- Visible evidence of alcohol or drug use aboard the vessel

These cues may indicate vessel maneuvers or operator behaviors associated with impairment. When such signs are present, the officer begins to develop an initial suspicion of BUI.

Based on these observations, the officer must determine whether there is reasonable suspicion to stop the vessel. At this point, the officer has three options:

- Stop the vessel to initiate further investigation
- Continue observing the vessel for additional cues
- Disregard the vessel if no further suspicion arises

If the officer decides to stop the vessel, the second task in Phase One involves observing how the operator responds to the signal to stop — typically using blue/red lights and/or a siren. The operator's behavior during this interaction may reveal additional indicators of impairment that contribute to the overall assessment and help build a foundation for further investigation.

INITIAL OBSERVATIONS: VISUAL CUES RESULTING FROM VESSEL OPERATION

The common effects of alcohol or drugs on a vessel operator's mental and physical faculties often result in predictable operating violations and observable vessel behaviors. These cues, which may indicate impairment, are described as follows:

TASK ONE - VISUAL CUE DESCRIPTIONS OF A VESSEL IN MOTION

Appearing to be Impaired - This cue refers to one or more observable indicators related to the personal behavior or physical appearance of the vessel operator. Examples of specific cues include:

- Eye fixation (short distance or long distance)
- Tightly gripping the steering wheel of the vessel
- Slouching in the seat driver's seat
- Gesturing erratically or obscenely
- Face close to the windshield
- Operator's head protruding from vessel

Almost Striking an Object or Vessel - This cue involves the observed vessel nearly colliding with a stationary object or another moving vessel. Examples include:

- Passing abnormally close to a buoy or other fixed object
- Navigating dangerously near another moving vessel
- Causing another vessel to take evasive action to avoid a collision

Weaving - Weaving occurs when a vessel alternately drifts toward one side of the waterway and then the other, creating a noticeable zigzag pattern. This lateral movement is typically consistent, with one steering correction closely followed by another.

Swerving - A swerve is defined as an abrupt turn away from a generally straight course. This maneuver may occur when the operator suddenly realizes the vessel is approaching another boat, drifting too close to shore, or encountering an unexpected obstacle.

Following Too Closely - This cue is observed when a vessel is following another vessel unreasonably or unnecessarily close, creating a potential safety hazard.

Stopping Inappropriately - The observed vessel stops at an inappropriate location or under inappropriate conditions, such as a designated swimming area or inappropriately approaching a dock for example.

Turning Abruptly or Illegally - The operator executes a turn that is either abnormally abrupt or illegal, such as turning at excessive speed or sharply into oncoming boating traffic.

Accelerating or Decelerating Rapidly - This cue refers to any instance of acceleration or deceleration that is significantly more rapid than what is appropriate for the current boating conditions. In some cases, the vessel may alternately accelerate and decelerate in quick succession.

Navigation Lights Off - The vessel is observed operating without navigation lights during a time when they are legally required.

Other Factors Affecting Boating Judgment and Skill

Two key factors distinguish boat operators from motor vehicle drivers in terms of judgment and operational skill.

1. The “Second Nature Effect”

Motor vehicle drivers often operate in familiar environments — commuting the same routes daily and navigating predictable traffic patterns. These routines foster what is known as the “second nature effect,” where driving becomes almost automatic. Drivers rely on ingrained habits and expectations about traffic flow, road conditions, intersections, and congestion. This can often account for moderately impaired drivers being able to reach their destination without incident, relying on muscle memory and environmental familiarity.

In contrast, boaters rarely benefit from this second nature effect.

Several factors contribute to this:

- Uncontrolled traffic flow, with vessels approaching from any direction (360 degrees)
- Wide variation in vessel speeds
- Lack of advisory signs or regulatory controls to guide uniform movement
- Infrequent operation, as most recreational boaters do not navigate regularly enough to develop instinctive handling skills

Photo Credit: Image by Charlotte Clark

Because of these conditions, an impaired boat operator is less able to rely on routine or familiarity and may struggle with even basic navigation tasks, even in calm conditions.

2. The Marine Environment

The marine environment itself presents unique challenges that further separate boating from driving:

- Boats lack brakes, and stopping distances vary significantly depending on speed and hull design
- Most recreational boaters are unfamiliar with their vessel's stopping capabilities
- Rules-of-the-road for water navigation — such as steering directions in meeting and overtaking situations — are often unknown or misunderstood by casual operators

Unlike experienced mariners who routinely operate vessels and understand their limitations, recreational boaters may not know how far their vessel will travel before coming to a complete stop from cruising speed. This lack of proficiency, combined with impairment, significantly increases the risk of unsafe operation. In many cases, recreational boaters rely on a single tactic: avoidance. But avoidance alone is not sufficient in complex or high-traffic situations, especially when alcohol or drugs impair judgment, coordination, and reaction time.

Understanding the Complexity of Vessel Operation

Operating a vessel is a complex task that requires the operator to manage multiple subtasks simultaneously—many of which demand both mental focus and physical coordination. These include:

Safe vessel operation depends on the ability to divide attention across these tasks.

- Steering
- Controlling the throttle
- Signaling (if required)
- Operating the gearshift
- Observing other boating traffic
- Observing navigation aids and waterway markers
- Making decisions (e.g., whether to stop, turn, accelerate, or decelerate)
- Monitoring weight distribution on the vessel
- Assessing environmental conditions such as wind and wave activity and water depth
- Scanning for hazards in the water, including debris and people
- Ensuring the safety of passengers engaged in activities such as water skiing or tubing, which requires constant vigilance, coordination, and communication

Safe vessel operation depends on the ability to divide attention across these tasks. Divided attention refers to the capacity to concentrate on two or more activities at once. Under the influence of alcohol or other drugs, this ability is significantly impaired. As a result, an impaired operator may focus only on the most immediate or obvious tasks, neglecting others that are equally critical—often leading to unsafe or unpredictable situations.

Some of the most compelling evidence gathered during all three phases of BUI detection is directly related to the operator's impaired ability to divide attention. Recognizing these signs is essential for effective investigation and prosecution.

TASK TWO - TYPICAL REINFORCING CUES OF THE STOPPING SEQUENCE

The second task during Phase One of the BUI detection process is for officers to observe how the vessel operator responds to their signal to stop — typically using flashing emergency lights and/or a siren. This interaction can reveal additional evidence of impairment. Observable cues may include:

- An attempt to flee
- No response to the signal
- A delayed or slow response
- An abrupt swerve
- A sudden stop
- Striking another boat or object

These behaviors often emerge because the stop command places additional demands on the operator's ability to divide attention. The signal to stop introduces a new situation that requires the operator to shift focus and respond appropriately. Flashing lights or sirens demand attention and force the operator to divide focus between maintaining control of the vessel and reacting to law enforcement. Even the act of stopping a vessel requires simultaneous coordination — turning the steering wheel while reducing speed. This increases the complexity of the task. An impaired operator may struggle to manage these demands, and their difficulty in doing so can provide further evidence of impairment.

PHASE 2: PERSONAL CONTACT

Phase Two, like Phase One, consists of two primary evidence-gathering tasks and one key decision point. The focus shifts to direct interaction with the vessel operator to assess signs of impairment through face-to-face contact.

Task One – Observation and Interview

This task begins once both the suspect vessel and the patrol vessel have come to a complete stop. It includes the officer's approach to the suspect vessel and encompasses all verbal and non-verbal interactions with the operator prior to their exit from the vessel. During this time, officers observe the operator's behavior, appearance, and responses for any indicators of impairment.

Photo Credit: Ohio Department of Natural Resources

Decision Point

Based on the observations and interview conducted during this phase — along with prior evidence from the vessel's motion and stopping sequence — officers must determine whether there is sufficient cause to instruct the operator to exit the vessel. This decision is discretionary and relies on what the officer sees, hears, and smells during the interaction.

Task Two – Observing the Exit Sequence

If an officer determines there is sufficient cause to instruct the operator to exit their vessel and perform field sobriety tests, the second task of Phase Two is to observe the operator's exit sequence. This includes watching for any signs of impairment as the operator transitions from their vessel to the patrol boat or dock. The manner in which the operator exits — such as balance, coordination, and physical demeanor — may reveal additional evidence of impairment that supports the officer's assessment.

TYPICAL INVESTIGATIVE CUES DURING THE OPERATOR INTERVIEW

As with DUI investigations, the face-to-face observation and interview of the operator enables officers to use their senses — sight, hearing, and smell — to detect signs of alcohol and/or drug impairment.

Sight-Based Indicators

During the interview, officers may observe a range of visual cues that suggest possible impairment, including:

- Bloodshot or watery eyes
- Abnormal pupil size
- Soiled or disheveled clothing
- Fumbling fingers or difficulty with simple tasks
- Presence of alcohol containers
- Presence of drugs or drug paraphernalia
- Visible bruises, bumps, or scratches
- Unusual or erratic behavior

Facial appearance can also provide clues. A flushed or drawn face may indicate intoxication, but in a boating case, it can also result from sun, wind, or salt exposure — or simply be a natural complexion. Because of this, defense attorneys may argue that no reliable inference of impairment can be drawn from it.

The eyes are particularly telling. A combination of bloodshot eyes, enlarged pupils, and slow or absent reaction to light may indicate alcohol or drug use — or both. While bloodshot eyes can result from eyestrain, irritants, fatigue, or sunlight exposure in a BUI

case, alcohol intoxication often causes the whites of the eyes to appear uniformly red or pink. Cannabis use may produce vivid red streaks across the whites of the eyes. Additionally, alcohol and certain drugs can cause pupils to react sluggishly — or not at all — to changes in light.

Hearing-Based Indicators

During the operator interview, officers may detect auditory cues that suggest alcohol and/or drug impairment. These include:

- Slurred speech
- Admission of alcohol or drug use
- Inconsistent or contradictory responses
- Abusive or aggressive language
- Unusual or inappropriate statements

Slurred speech is a common symptom of intoxication, though it may also result from speech disorders or simply an inability to pronounce words correctly. Alcohol's mild anesthetic effect can cause the tongue to feel thick or numb — similar to the sensation caused by Novocain — leading to elongated syllables and distorted pronunciation. To distinguish slurred speech from other causes, officers pay close attention to how the operator articulates words with varied vowel and consonant combinations.

Changes in speech patterns are also significant. Officers are trained to notice shifts such as:

- Rapid to slow speech, or vice versa
- Loud to soft speech, or vice versa
- Clear articulation to confused or incoherent speech

These fluctuations may reflect the influence of substances on the central nervous system, which affects judgment, inhibitions, and emotional regulation. Behavioral changes often accompany auditory cues. Officers may observe shifts in demeanor, such as:

- Cooperative to uncooperative
- Calm to threatening
- Threatening to pleading

Mood swings may also be evident, including transitions from:

- Serious to silly
- Happy to depressed
- Caring to indifferent

Such changes may indicate that the individual is not fully aware of their surroundings or the seriousness of the situation.

Smell-Based Indicators

During the operator interview, officers may detect odors that serve as potential evidence of alcohol and/or drug use. Common olfactory cues include:

- The scent of alcoholic beverages
- The smell of cannabis
- "Cover-up" odors such as breath sprays or mouthwash
- Other unusual or unexplained odors

When documenting the odor of alcoholic beverages, officers are trained to be specific about its source. For example, is the odor coming from:

- The operator's breath?
- Clothing that may have alcohol spilled on it?
- Perspiration, especially in hot conditions where alcohol consumption may be high?
- The surrounding area, such as spilled alcohol near the operator?

It is important to note that the absence of odor does not necessarily mean the operator is not impaired. A lack of detectable alcohol scent may result from the method of ingestion or deliberate attempts to mask the odor using breath mints, mouthwash, tobacco, or other substances.

INTERVIEW / QUESTIONING TECHNIQUES

Similar to a DUI, while the operator remains at the helm, officers may employ a variety of techniques to assess potential impairment. Many of these methods rely on the principle of divided attention which requires the operator to focus on multiple tasks simultaneously. These techniques include both verbal questioning and psychophysical (mind-body) tasks. Although not as standardized or reliable as formal field sobriety tests, they can be quite useful in identifying signs of impairment.

Officers may use three primary questioning strategies to evaluate the operator's ability to process and respond to information:

1. Requesting Two Things Simultaneously

   Example: Asking the operator to produce both their license and vessel registration. Indicators of impairment may include:

   - Forgetting to provide one or both documents
   - Producing incorrect or unrelated documents

- Failing to locate the requested items while searching
- Fumbling or dropping items
- Difficulty retrieving items using fingertips

2. Asking Interrupting or Distracting Questions

   Example: While the operator searches for documents, the officer may ask, "Without looking at your watch, what time is it right now?"
   Possible signs of impairment include:

   - Ignoring the question and focusing only on the document search
   - Forgetting to resume the search after answering
   - Providing a grossly inaccurate response

3. Asking Unusual Questions

   Example: After obtaining the operator's license, the officer might ask, "What is your middle name?" These questions are designed to prompt unexpected cognitive processing.
   An impaired operator may:

   - Misinterpret the question (e.g., responding with their first name instead of middle name)
   - Struggle to answer a question they would normally find easy

These techniques help officers assess the operator's ability to comprehend, retain, and respond to information — skills that are often compromised by alcohol or drug use.

<u>Boating Safety Equipment Inspection as a Divided Attention Task</u>

Another investigative method in the marine environment involves conducting a systematic boating safety equipment inspection. Officers may request specific safety items, such as:

- "Can I see a wearable life jacket for each person on board and a throwable life preserver?"

Keeping the operator actively engaged in retrieving and handling these items — such as passing out life jackets or attempting to put one on — adds a physical component to the divided attention task. This approach can reveal coordination issues, confusion, or other signs of impairment while simultaneously fulfilling safety inspection

TYPICAL CUES DURING THE EXIT SEQUENCE

> **In all cases, safety takes precedence over investigative concerns.**

An officer's decision to instruct the operator to exit the vessel is typically based on a developing suspicion of impairment. However, safety considerations — especially those concerning the officer's well-being — may also necessitate the operator's exit of their vessel. In all cases, safety takes precedence over investigative concerns.

The manner in which the operator exits the vessel can provide valuable evidence of impairment. Officers are trained to observe the following behaviors and physical cues:

- Displays of anger or other unusual emotional reactions
- Inability or refusal to follow instructions
- Failure to place the vessel in neutral or turn off the engine
- Climbing out of the vessel in an awkward or unstable manner
- Leaning against the vessel for support
- Keeping hands on the vessel to maintain balance

In addition to behavioral cues, officers may also note physical evidence of alcohol or drug use during this phase. Items such as empty beverage containers, coolers, drug paraphernalia, or other signs of consumption may be visible within the vessel.

Photo Credit: The U.S. Coast Guard

Following this face-to-face interaction and observation during Phase Two, the officer must determine whether there is sufficient cause to request the operator to perform standardized field sobriety tests.

PHASE 3: PRE-ARREST SCREENING

Once the officer has established reasonable suspicion, they may proceed to request the vessel operator to perform field sobriety tests. These tests are typically administered while the operator is aboard the patrol vessel.

Officers assigned to maritime patrol duties should be trained and proficient in the Seated Standardized Field Sobriety Tests (SFSTs), which are specifically designed for use in marine environments. When properly administered, the seated SFSTs provide a reliable and scientifically validated basis for determining whether to proceed with an arrest or release — much like the traditional standing SFSTs used on land.

This phase is critical in confirming impairment and ensuring that any enforcement action taken is supported by observable, documented evidence.

DEVELOPMENT AND VALIDATION OF THE SEATED SFSTS

For many years, maritime enforcement officers relied on a variety of field sobriety tests to assist in BUI investigations. However, much like the period before the scientific validation of the standing SFSTs, these tests were administered inconsistently across jurisdictions. Training on these tests varied widely —and in some cases, was entirely absent.

Recognizing these challenges, the United States Coast Guard initiated research in 1987 to evaluate field sobriety tests specifically for maritime use. The resulting study, *An Experimental Evaluation of a Field Sobriety Test Battery in the Marine Environment*,[17] was the first to apply research methodology to determine whether recreational boating conditions affected the accuracy of field sobriety tests. In this study, 97 volunteers were dosed with alcohol and tested both on land and aboard a vessel using a variety of assessments, including:

- Horizontal Gaze Nystagmus (HGN)
- Alphabet Recital
- Hand Pat
- Finger Count
- Finger to Nose
- Walk and Turn
- One Leg Stand

Photo Credit: Minnesota Department of Natural Resources

Based on observations and interviews, officers made correct arrest or release decisions 82% of the time, using a BrAC (Breath Alcohol Content) threshold of 0.10 — the per se illegal level at the time.[18] While promising, this study did not result in scientifically validated field sobriety tests tailored for the marine environment.

[17] Sussman, E. D., A. Needalman, and P. H. Mengert. An Experimental Evaluation of a Field Sobriety Test Battery in the Marine Environment. U.S. Coast Guard, U.S. Department of Transportation, 1990.
[18] Sussman et al, 1990, p. 41.

To address these shortcomings, the U.S. Coast Guard sponsored a second study, managed by the NASBLA and conducted by the Southern California Research Institute (SCRI) — the same institute that developed the standing SFSTs. The goal was to create sobriety tests for use by water patrol officers that could be administered in a seated position and reliably detect impairment at a BrAC of 0.08 or greater for use.[19] The research was guided by four key criteria[20]:

1. Tests must be administered while seated.
2. Tests must effectively detect impairment at a BrAC of 0.08.
3. Tests must be easy to administer for the maritime enforcement.
4. Tests must not rely on the subject's equilibrium.

Study Phases and Findings

Year One:

Researchers reviewed 1,146 BUI arrest reports from 14 U.S. law enforcement agencies. From these, 15 field sobriety tests were identified as promising. Six were selected for further evaluation[21]:

- Finger to Nose
- Time Estimation
- Finger Count
- Hand Coordination
- Palm Pat
- Horizontal Gaze Nystagmus (HGN)

Year Two:

In the second year of the study, researchers had as their objective to "further refine the development of the seated battery and identify the most alcohol-sensitive tests."[22] To achieve this, they conducted controlled laboratory testing with 157 volunteers, dosing them to BrAC levels closely clustered around 0.08, with the highest reaching 0.11. This approach differed from earlier studies, which typically involved higher BrAC levels.[23] The use of lower BrAC concentrations reflected real-world enforcement challenges, where detecting impairment near the legal limit can be more difficult — even for experienced officers. As a result, the overall sensitivity of the tests was lower than what is typically reported in the literature for the standing SFSTs.[24]

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[19] Fiorentino, D. D., Dietel, B. M., & Jimenez, D. D. (2011). Development of Sobriety Tests for the Marine Environment. Transportation Research Record, 2222(1), 85-89. https://doi.org/10.3141/2222-11.

[20, 21] Fiorentino et al., 2011.

[22] National Association of State Boating Law Administrators: Comprehensive BUI Detection and Enforcement Course Manual (2020).

[23, 24] *Id.*

Despite this, the study successfully identified the four most reliable tests for detecting impairment at or above a BrAC of 0.08[25]:

- Horizontal Gaze Nystagmus (HGN)
- Finger to Nose
- Palm Pat
- Hand Coordination

Year Three:

During the third year of the study, researchers focused on validating the seated SFSTs in real-world conditions. Their objectives were clearly defined[26]:

1. Develop standardized, practical, and effective procedures for officers to make arrest or release decisions using standardized administrative protocols, clues, and evaluation criteria.
2. Test the feasibility of these procedures in the marine environment.
3. Collect field data to determine whether the tests perform as effectively in operational settings as they do in laboratory conditions.

To meet these goals, researchers conducted fieldwork alongside members of the Missouri State Water Patrol (now part of the Missouri Highway Patrol) over a four-month period during the boating season on Lake of the Ozarks.[27] Unlike the earlier Coast Guard study, this effort ensured that participating officers were highly trained in BUI enforcement, particularly in administering the HGN test. This distinction is important, as the lack of such training in the earlier study may have contributed to lower reliability scores for the HGN test.[28]

During the field validation, officers conducted 331 vessel stops. In maritime law enforcement, officers generally do not require probable cause or reasonable suspicion to stop a vessel for a safety inspection. However, the study revealed compelling statistics:

- When officers conducted stops based on probable cause for a boating violation, vessel operators had a BrAC of 0.08 or greater, 58% of the time.
- Across all stops, including those without probable cause, vessel operators had a BrAC of 0.08 or greater, 42% of the time.[29]

[25, 29] Fiorentino et al., 2011.
[26] National Association of State Boating Law Administrators: Comprehensive BUI Detection and Enforcement Course Manual (2020).
[27] *Id.*
[28] Fiorentino et al., 2011, National Association of State Boating Law Administrators: Comprehensive BUI Detection and Enforcement Course Manual (2020).

These findings were significant for maritime enforcement officers, highlighting the prevalence of alcohol impairment among recreational boaters and reinforcing the need for reliable screening tools.

The results of the field validation phase demonstrated the effectiveness and practicality of the seated SFSTs in detecting impaired vessel operators.[30] The following table summarizes these results. The column titled PPV (Positive Predictive Value) represents the percentage of correct arrest or release decisions made by officers using each test or combination of tests.

Table 20
Prediction of BAC Status by Four Tests Alone and in Combination

Test	Prevalence	% Correct	Sensitivity	Specificity	PPV	NPV	LR+	LR-	*p*
1-HGN Positive/Negative	.43	84.8	.86	.84	.80	.89	5.27	.16	.000
2-FTN Positive/Negative	.42	67.3	.49	.81	.65	.68	2.56	.63	.000
3-PP Positive/Negative	.42	65.2	.76	.57	.57	.77	1.77	.41	.000
4-HC Positive/Negative	.42	59.4	.62	.57	.52	.67	1.46	.66	.000
1, 2	.43	74.5	.46	.96	.89	.70	10.80	.57	.000
1 ,3	.43	81.5	.70	.90	.84	.80	6.96	.33	.000
1, 4	.43	76.0	.56	.90	.81	.74	5.93	.48	.000
2, 3	.42	68.5	.41	.89	.73	.67	3.68	.67	.000
2, 4	.42	65.8	.34	.89	.70	.65	3.19	.74	.000
3, 4	.42	66.1	.51	.77	.62	.68	2.22	.63	.000
1, 2, 3	.43	72.0	.39	.97	.90	.68	12.15	.63	.000
1, 2, 4	.43	69.0	.31	.97	.88	.66	9.90	.71	.000
1, 3, 4	.43	74.5	.49	.93	.84	.71	7.17	.54	.000
2, 3, 4	.42	66.1	.29	.93	.76	.64	4.28	.76	.000
1, 2, 3, 4	.43	68.1	.28	.98	.91	.65	13.16	.74	.000
1 and any other one test	.43	84.5	.81	.87	.82	.86	6.36	.22	.000
1 and any other two tests	.43	79.3	.64	.91	.84	.77	7.07	.40	.000
2 and any other one test	.43	70.8	.44	.91	.78	.69	4.84	.62	.000
2 and any other two tests	.43	70.8	.44	.91	.78	.69	4.84	.62	.000
3 and any other one test	.43	71.3	.73	.70	.65	.78	2.46	.39	.000
3 and any other two tests	.43	76.3	.61	.87	.78	.75	4.84	.44	.000
4 and any other one test	.43	66.3	.59	.71	.61	.70	2.08	.57	.000
4 and any other two tests	.43	73.3	.54	.87	.76	.72	4.28	.52	.000

Note. PPV = Positive predictive value. NPV = Negative predictive value. LR+ = Positive likelihood ratio. LR- = Negative likelihood ratio. *p* = Significance of the test (χ^2) of the full model against a constant-only model. HGN = Horizontal gaze nystagmus. FTN = Finger to nose. PP = Palm pat. HC = Hand coordination.

[30] Fiorentino et al., 2011.

DEVELOPMENT AND VALIDATION OF THE SEATED SFSTS

When officers made arrest or release decisions based on individual tests, the Positive Predictive Values (PPV) — the percentage of correct decisions — were as follows:

- Horizontal Gaze Nystagmus (HGN) test: 80%
- Finger to Nose test: 65%
- Palm Pat test: 57%
- Hand Coordination test: 52%

Photo Credit: South Carolina Department of Natural Resources, Division of Law Enforcement

When arrest or release decisions were based collectively on the Finger to Nose, Palm Pat, and Hand Coordination tests — excluding the HGN test — the PPV increased to 76%. Most notably, when officers made an arrest or release decision on all four seated SFSTs together, the PPV rose to 91%.[31]

These results are significant not only for the high level of accuracy of the officers' decisions, but also for their alignment with findings from the most recent validation study of the standing SFSTs. The *Validation of the Standardized Field Sobriety Test Battery at BACs Below 0.10 Percent*[32] concluded that when officers used the HGN, Walk and Turn, and One Leg Stand tests, they made correct arrest or release decisions 91% of the time — the same level of accuracy achieved with the seated SFST validation study. This significant parallel demonstrates that well-trained officers administering standardized field sobriety tests can make highly accurate decisions regardless of whether the subject is seated or standing.[33]

Further supporting the reliability of the seated SFSTs is research by Citek et al.[34], which found that:

> "The proper use of the HGN and [Vertical Gaze Nystagmus] tests at any test posture will help an officer correctly identify individuals impaired with alcohol at BACs of 0.08% and higher. By extension, since other CNS depressant drugs, inhalants, and PCP affect the same neural centers as alcohol, DRE officers can use the same tests and test postures to aid in identification of impairment with substances other than, or in addition to, alcohol."

This finding is critically important, as it refutes the argument that a seated position compromises the effectiveness of the HGN test. When properly administered, the HGN test remains a reliable indicator of impairment — regardless of the subject's posture.[35]

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[31] Fiorentino et al., 2011.
[32] Stuster, J., & Burns, M. (1998, August). Validation of the Standardized Field Sobriety Test Battery at BACs Below 0.10 Percent. Santa Barbara, CA: Anacapa Sciences, Inc.
[33] Burns, M., & Anderson, E. (1995, November). A Colorado Validation Study of the Standardized Field Sobriety Test (SFST) Battery. Colorado Department of Transportation. Burns, M., & Dioquino, T. (1997). A Florida Validation Study of the Standardized Field Sobriety Test (SFST) Battery. National Highway Traffic Safety Administration.
[34] Citek, K., Ball, B., & Rutledge, D. A. (2003, November). Nystagmus Testing In Intoxicated Individuals. Optometry, 74(11), 695-710.
[35] Leigh, R., & Zee, D. (2015). The Neurology of Eye Movements, Fifth Edition.

THE SEATED STANDARDIZED FIELD SOBRIETY TEST – TEST INSTRUCTIONS AND VALIDATED CLUES

Following the 2010 seated SFST study, NASBLA developed a systematic approach for investigating BUI incidents. These procedures include structured questions and instructions for the officer to present to the suspect, along with scientifically validated observational clues that the officer can document to support an informed arrest or release decision. The following information is derived from the NASBLA Comprehensive BUI Detection and Enforcement Course Manual (2020):

Pre-Test Questions

The investigating officer must ask the following questions to the suspect prior to administering the seated SFSTs:

- Do you have any physical defects or disabilities?
- Do you have any defects with your eyes?
- Are you sick or injured?
- Are you under the care of a doctor or dentist?
- Are you taking any medication or drugs?

If the suspect answers in the affirmative to any of these questions, the officer should ask clarifying questions to determine if the suspect needs medical treatment or if the officer's observations may be the result of a pre-existing medical condition.

General Instructions

As the seated SFSTs are to be administered to the suspect while they are in the seated position, the officer must provide the suspect with the following instructions to ensure they are properly situated prior to beginning the tests:

- "Please sit straight at the front edge of your seat."
- "Put your arms down at your sides."
- "Place your feet shoulder-width apart so you are comfortable and stable. Are you stable?"
- "Do not move your feet until the tests are over."
- "Stay in this position and do not do anything else until I tell you to do so. Do you understand?"

As with any law enforcement activity, officer safety is of great importance when administering the seated SFSTs. Officers may instruct the subject to cross their ankles

instead of placing their feet shoulder-width apart if they believe this will ensure their safety. However, further modifications to the general instructions, of any portion of the tests, could compromise their validity.

Horizontal Gaze Nystagmus Test

The procedures for this test are the same as those in the standing SFSTs, with the exception that the subject will not be instructed to maintain a standing position. The following procedures will be followed by the officer during this test:

- Have the subject remove their eyeglasses, if worn.
- "Are you wearing contact lenses?"
- "Keep your head still and look at the stimulus. Follow the movement of the stimulus with your eyes only. Keep looking at the stimulus until you are told the test is over. Do you understand?"
- Position the stimulus 12 – 15 inches away from the subject and slightly above their eye level.
- Check for equal pupil size, resting nystagmus, and equal tracking.
- Check for a lack smooth pursuit in both eyes, beginning with the subject's left eye. Perform this procedure at least twice per eye (one clue in each eye for a total of two clues).
- Check for distinct and sustained nystagmus at maximum deviation in both eyes, beginning with the subject's left eye. Perform this procedure at least twice per eye (one clue in each eye for a total of two clues).
- Check for an onset of nystagmus prior to 45 degrees in both eyes, beginning with the subject's left eye. Perform this procedure at least twice per eye (one clue in each eye for a total of two clues).
- Total the clues (three clues in each eye for a total of six clues.
- Check for vertical gaze nystagmus in in both eyes, performing the check at least twice.

Four or more clues indicate the subject is likely impaired with a BrAC of 0.08 or greater. During the field validation study when officers observed four or more clues, they made the correct arrest or release decision 80% of the time[36]. This is consistent with the research conducted by Stuster and Burns[37] in which they concluded that when the subject's BrAC was 0.08 or greater, officers made the correct arrest or release decision after observing four or more clues 88% of the time.[38]

[36] Fiorentio et al, 2011.
[37] Stuster, J., & Burns, M. (1998, August). Validation of the Standardized Field Sobriety Test Battery at BACs Below 0.10 Percent. Santa Barbara, CA: Anacapa Sciences, Inc.
[38] Horizontal Gaze Nystagmus: The Science and the Law: A Resource Guide for Judges, Prosecutors and Law Enforcement (1999). National Traffic Law Center. National Highway Traffic Safety Administration. Retrieved from https://www.nhtsa.gov/sites/nhtsa.gov/files/documents/horizontal_gaze_nystagmusthe_science_and_the_law.pdf.

Finger to Nose Test

Officers and prosecutors with knowledge of the Advanced Roadside Impaired Driving Enforcement (ARIDE) and/or the Drug Recognition Expert (DRE) curriculum from the National Highway Traffic Safety Administration (NHTSA) are likely familiar with this test, albeit not with the validated clues. The following procedures will be followed by the officer during this test:

- "Make a fist with both hands, extend your index fingers, and turn your palms forward. Remain in this position while I explain the test (the officer will demonstrate the position). Do you understand?" "When I say begin, tilt your head back to about a 45-degree angle and close your eyes (the officer will demonstrate the position)."
- "When I tell you to, touch the tip of your nose with the tip of your index finger and immediately return it to your side (the officer will explain the fingertip, pad and sides of the fingers, the tip of the nose, and demonstrate touching the tip of their nose with the tip of their index finger)."
- "When I say right, you must touch your right index finger to your nose. When I say left, you must touch your left index finger to your nose. Do you understand?"
- "Begin."
- After the subject tilts their head back, the officer will give the following commands in this order: "Left. Right. Left. Right. Right. Left."
- "Open your eyes and straighten your head."

During the instruction stage, the officer may observe the following clues:

1. Unable to follow instructions: The test had to be explained to the subject more than twice or the subject did not remain in the instruction position (one clue).
2. Started at the wrong time: The subject began the test before being told to do so either by tilting their head back and/or closing their eyes or by raising either finger before being told to do so (one clue).

During the performance stage, the officer may observe the following clues:

1. Did not close eyes: The subject failed to close their eyes when told to begin the test (one clue).
2. Did not tilt head back: The subject failed to tilt their head back when told to begin the test (one clue).
3. Opened eyes during the test: The subject opened their eyes during the test (one clue).
4. Moved head during test: The subject moved their head backward, forward, or side to side at least one inch after beginning the test (one clue).
5. Wrong hand: The subject made contact to the nose with the wrong hand (one clue, repeatable six times).

6. Wrong finger: The subject used any finger other than the index finger (one clue, repeatable six times).
7. Hesitated: The subject started with one hand but then changed to the other hand prior to making contact with the nose, or the subject paused or significantly slowed down upon approach to and prior to making contact with the nose (one clue, repeatable six times).
8. Searched: The subject made any distinct vertical or horizontal movement with the finger upon approach to and prior to making contact with the nose (one clue, repeatable six times).
9. Not fingertip / missed fingertip: The subject touched the nose with any part of their finger other than the area of the index finger immediately below the fingernail tip (one clue, repeatable six times).
10. Missed tip of the nose: The subject failed to touch any part of the finger to the tip of the nose (one clue, repeatable six times).
11. Did not bring hand down: The subject failed to immediately (if contact is more than one second) bring their finger back down to the side after making contact with the nose (one clue, repeatable six times).

There are 13 observable clues during this test, of which seven clues can be documented up to six times. Therefore, there are 48 validated clues during this test. Nine or more clues indicates the subject is likely impaired with a BrAC of 0.08 or greater. During the field validation study when officers observed nine or more clues, they made the correct arrest or release decision 65% of the time.[39]

Palm Pat Test

The following procedures will be followed by the officer during this test:

- "Place your hands palm to palm with one hand up and one hand down, like this (the officer will demonstrate the position). Remain in this position while I explain the test. Do you understand?"
- "When I tell you to begin, turn the top hand over and count out loud 'one,' then turn the hand back over and count out loud 'two,' counting only when the hands make contact, like this (the officer will demonstrate the procedure)."
- "Repeat this, speed up as you go, and do not stop until told. Make sure to keep your hands and fingers parallel during each pat, like this (the officer will demonstrate the procedure)."
- "Do you understand?"
- "Begin."
- The officer will allow the subject to perform the test for approximately 10 – 15 seconds, instructing them to increase their speed every four to five seconds as needed.

[39] Fiorentio et al, 2011.

During the instruction stage, the officer may observe the following clues:

1. Unable to follow instructions: The test had to be explained to the subject more than twice or the subject did not remain in the instruction position during the instruction stage (one clue).
2. Started at the wrong time: The subject began the test before being told to begin either by starting on their own at any time or by following along with the officer's demonstration (one clue).

During the performance stage, the officer may observe the following clues:

1. Did not count as instructed: The subject counted out loud anything other than "1, 2, 1, 2, 1, 2," and so on. "1" must be said out loud only when the back of the top hand makes contact with the palm of the bottom hand, and "2" must be said out loud only when the palm of the top hand makes contact with the palm of the bottom hand. This clue is also documented if the subject fails to count out loud (one clue).
2. Rolled hands: The subject failed to fully break contact between the two hands when going from one pat to the next, simulating a rolling movement on the bottom hand with the top hand (one clue).
3. Double pat: The subject conducted two or more of the same pat in a row e.g. the subject patted the palm of the top hand to the palm of the bottom hand twice in a row (one clue).
4. Chopped pat: The subject hit the bottom hand with the side of the top hand instead of either the palm or the back of the top hand (one clue).
5. Other improper pat: The subject conducted any pat other than what is instructed and which cannot be described above. The officer must document how the other improper pat occurred (one clue).
6. Did not increase speed: The subject did not make a noticeable increase in speed within any four to five second period of the test (one clue).
7. Rotated hands: The subject's fingers no longer ran parallel to each other resulting in a noticeable and distinct rotation in any pat (one clue).
8. Stopped before being told: The subject stopped at any time before the command to stop was given (one clue).

There are 10 validated clues during this test. Two or more clues indicate the subject is likely impaired with a BrAC of 0.08 or greater. During the field validation study when officers observed two or more clues, they made the correct arrest or release decision 57% of the time.[40]

[40] Fiorentio et al, 2011.

Hand Coordination Test

Adapted from the Walk and Turn test, this test simulates a subject making walking motions with their hands. The following procedures will be followed by the officer during this test:

- "Make fists with both hands. Place the left fist at the center of your chest, and your right fist against your left fist." The officer will demonstrate the position.
- "Remain in this position while I explain the test. Do you understand?"
- "When I say begin, you must perform four tasks."
- "The first task is to count out loud from one to four while you move your fists in a step-like fashion, making contact between your fists at each step." The officer will demonstrate the procedure.
- "The second task is to memorize the position of your fists after you have counted to four, clap your hands three times, and return your fists to the memorized position." The officer will demonstrate the procedure.
- "The third task is to move your fists in a step-like fashion in reverse order, counting out loud from five to eight, and returning your left fist to your chest." The officer will demonstrate the procedure.
- "The fourth task is to open your hands with palms down and place them in your lap." The officer will demonstrate the procedure.
- "Do you understand?"
- "Begin."

During the instruction stage, the officer may observe the following clues:

1. Unable to follow instructions: The test had to be explained to the subject more than twice or the subject did not remain in the instruction position. This clue is also documented if the subject puts their right fist to their chest instead of their left fist when told to put the left fist against chest (one clue).
2. Started at the wrong time: The subject began the test before being told to begin either by starting on their own or by following along with the officer's demonstration (one clue).

During the performance stage (first task), the officer may observe the following clues:

1. Improper count: The subject counted anything other than "1, 2, 3, 4," while moving the fists away from the chest four times in a step-like fashion. This clue is also documented when the subject does not count out loud or counts too many or too few (one clue).

2. Improper touch: The subject dragged their fists over one another while moving from one step to another, the subject did not make end-to-end contact between the two fists, or the subject made top to bottom contact between the two fists (one clue).

3. Did not perform: The subject skipped over and did not perform this task (one clue).

During the performance stage (second task), the officer may observe the following clues:

1. Improper count: The subject did anything but clap three times. This clue is also documented if the subject performs too many or too few claps (one clue).
2. Improper touch: The subject made any contact between the hands other than palm-to-palm clapping (one clue).
3. Improper return: The subject did not return their fists to the memorized position end-to-end with the right fist in front of the left fist (one clue).
4. Did not perform: The subject skipped over and did not perform this task (one clue).

During the performance stage (third task), the officer may observe the following clues:

1. Improper count: The subject counted anything other than “5, 6, 7, 8,” while moving their fists in toward the chest four times in a step-like fashion. This clue is also documented when the subject does not count out loud or counts too many or too few steps (one clue).
2. Improper touch: The subject dragged their fists over one another while moving from one step to the next, the subject did not make end-to-end contact between the two fists, or the subject made top to bottom contact between the two fists (one clue).
3. Did not return left fist to chest: The subject did not make contact to the chest with the left fist, or the subject brought the right fist to the chest instead of the left fist (one clue).
4. Did not perform: The subject skipped over and did not perform this task (one clue).

During the performance stage (fourth task), the officer may observe the following clues:

1. Improper position: The subject opened their fists and placed them anywhere other than on their lap (one clue).
2. Did not perform: The subject skipped over and did not perform this task (one clue).

THE SEATED STANDARDIZED FIELD SOBRIETY TEST

There are 15 validated clues during this test. Three or more clues indicate the subject is likely impaired with a BrAC of 0.08 or greater. During the field validation study when officers observed two or more clues, they made the correct arrest or release decision 52% of the time.[41]

[41] Fiorentio et al, 2011.

PREPARING A BUI CASE FOR TRIAL: PROSECUTORIAL CONSIDERATIONS

For prosecutors unfamiliar with BUI cases, trial preparation shares many similarities with DUI cases — but includes critical differences tied to the unique nature of maritime enforcement. The following guidance outlines key considerations at each stage of preparation.

Initial Case Review

Before diving into the case file, prosecutors should first review the relevant BUI statute and understand the specific elements that must be proven. As with any criminal case, it is essential to begin reviewing the file as soon as practicable after receipt to ensure all necessary evidence has been collected and to identify any missing items.

Examples of missing evidence may include:

- Surveillance footage from marinas, restaurants, bars, or cannabis dispensaries visited by the defendant
- Receipts for alcohol or cannabis purchases
- Previously unidentified witnesses
- Video evidence showing the defendant's physical condition (e.g., ability to walk) before or after the incident

As prosecutors are aware, time is of the essence. Surveillance footage is often deleted after short retention periods, receipts may not be preserved, and witness memories and contact details can quickly fade or change.

Evidence Assessment and Issue Tracking

Once the bulk of the evidence is assembled, prosecutors should begin assessing the strengths and weaknesses of the case. Maintaining a running list of potential issues is helpful. This list should distinguish between the following:

- Issues that can be supplemented or resolved through further investigation or evidence gathering
- Issues that must be addressed directly during trial preparation

This proactive approach allows for strategic planning and helps avoid surprises in court.

Anticipating Defenses

After thoroughly reviewing the case file, prosecutors should consider likely defense strategies, which may include:

- Challenging the legality of the initial stop
- Questioning probable cause for arrest
- Attacking the validity of the seated SFST evaluations
- Disputing the accuracy or admissibility of chemical test results, particularly due to delays with obtaining the tests

As discussed earlier, common defenses in BUI cases are that the cues leading to the stop and arrest are due to conditions of the marine environment (wind, waves etc.) rather than impairment. As these issues often lead to pretrial motions, prosecutors should be familiar with these tactics and prepare to counter them with well-supported arguments and evidence.

CONSIDERING EXPERT WITNESSES IN BUI CASES

After conducting a thorough review of the case file and assessing its strengths and weaknesses, prosecutors should evaluate whether the case would benefit from the inclusion of expert witnesses. While toxicologists and DREs are commonly used in DUI cases, BUI cases may also call for specialized experts such as seated SFST instructors, marine mechanics, and boating safety course instructors.

Toxicologists

If a toxicology report is part of the case, it is essential for the prosecutor to consult with the crime lab. Understanding the lab's procedures for evidence handling and testing protocols is critical for crafting a direct examination that presents complex scientific information in a way that is digestible for a jury.

Given recent Supreme Court rulings, it is imperative that the toxicologist who performed the actual testing be available to testify at trial.[42] In alcohol-related cases, a toxicologist can help lay the foundation for introducing numerical BAC results and provide context for interpreting those results.[43] In drug-related cases — especially those involving prescription medications — a toxicologist's analysis is vital for explaining the effects and side effects of the substances detected.[44]

[42] Smith v. Arizona, 602 U.S. 779 (2024).
[43] https://ndaa.org/wp-content/uploads/Alcohol-Toxicology.pdf.
[44] https://ndaa.org/wp-content/uploads/Drug-Toxicology-for-Prosecutors-2023_compressed.pdf.

Pretrial preparation with the toxicologist is also important to understand the limitations of their testimony, particularly in BUI cases where delays in obtaining samples may affect the reliability of results. These conversations will help determine whether the available evidence is sufficient to proceed and what, if any, additional information is necessary to support their admission.

Drug Recognition Experts (DREs)

When considering the use of a DRE, prosecutors should consult with the DRE directly to clarify what they can and cannot testify to, especially in light of local evidentiary standards *(e.g., Daubert or Frye)*. DREs are particularly valuable in cases where blood was not obtained—due to refusal, lack of a warrant, or time delays — or where results are inconclusive.

Even if the DRE was not present at the scene, they may be able to conduct a post-incident review of the case. This can strengthen the prosecution's case by allowing the DRE to testify about observed behaviors on video and explain how those manifestations are consistent with impairment from specific drug categories. This can also counter defense arguments that these observations stem solely from the marine environment and not impairment.

Seated SFST Instructors

These experts are especially useful when the admissibility or administration of seated SFSTs is likely to be challenged. If the arresting officer lacks experience or confidence in explaining the seated SFSTs, a seated SFST instructor[45] can provide authoritative testimony on the tests' development, scientific basis, and proper administration.

Photo Credit: National Association of State Boating Law Administrators

When video footage of the SFSTs is available, these subject matter experts can review it and offer an expert opinion on whether any deviations from protocol were significant or inconsequential. Their testimony can also help rebut defense claims that the seated tests are unreliable or improperly administered.

[45] State Boating Contacts - NASBLA.

Marine Mechanics

Depending on the facts of the case, a certified marine mechanic may be a valuable witness. They can explain the normal operation of the vessel, clarify whether any mechanical issues were present, and help the jury understand whether erratic behavior was due to impairment or equipment malfunction.

Boating Safety Instructors

A boating safety instructor may be useful in cases where the defendant has completed a safety course. Their testimony can establish what the defendant was taught regarding safe operation, navigation rules, and alcohol use — helping to demonstrate that the defendant knew better than to act as they did.

REVIEWING DEFENDANT INFORMATION

Conducting a thorough review of the defendant's background is a critical step in preparing a BUI case for trial — especially if the defendant is expected to testify. Prosecutors should collaborate with the investigating officer and, where available, utilize their office's investigator to gather relevant information. Key areas to examine for the BUI case include:

Driving and Boating History

- Obtain a certified driving history that includes both roadway and waterway records.
- Research the admissibility of prior driving offenses under your state's evidentiary rules. While most jurisdictions prohibit the use of prior offenses as propensity evidence during the case-in-chief, they may allow such evidence for specific purposes (e.g., knowledge, intent, or absence of mistake).
- Prior convictions may also be relevant for sentencing enhancements, so ensure you have certified copies of any applicable convictions or a certified driving abstract.

Boating Safety Training

- Determine whether the defendant has completed any boating safety courses.
- Obtain a copy of their boating safety card and any manuals or materials provided during the course.
- If applicable, consider calling the State Boating Law Administrator or a boating safety instructor to testify about the training received — especially if the defendant violated principles covered in the course (e.g., safe operation, alcohol use).

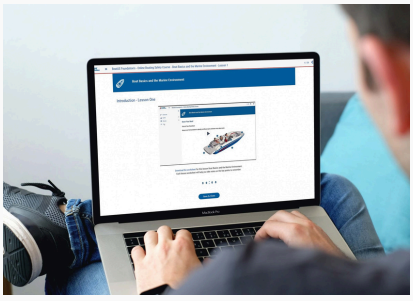


Photo Credit: Water Sports Foundation

Boating Experience and Ownership

- Investigate the defendant's prior boating experience, including ownership or regular use of boats, jet skis, or other watercraft.
- This information can support arguments such as:
  - "The defendant should have known better."
  - "The defendant lacked sufficient experience to safely operate the vessel."

This background information can be strategically valuable in both the prosecution's case-in-chief and in rebuttal, particularly when addressing defenses related to lack of knowledge, inexperience, or credibility.

IDENTIFYING ALL NECESSARY WITNESSES

In addition to professional and expert witnesses, prosecutors should carefully evaluate whether any civilian witnesses will be called to testify. As with the defendant, conducting a thorough background review of each witness is essential to trial preparation.

If possible — and if the witnesses are cooperative — the prosecutor should arrange a pretrial meeting to discuss their anticipated testimony. Key areas to explore include:

- The witness's ability to place the defendant at the helm of the vessel
- Any potential bias or prejudice toward the defendant
- Whether the witness was also consuming alcohol or other impairing substances on the day of the incident
- The witness's knowledge of boating safety, which may affect their credibility or understanding of the situation

If the prosecutor anticipates that a witness will be called by the defense, it may be relevant to investigate whether that individual has a prior BUI or DUI conviction. This could be particularly useful if the witness intends to testify that the defendant appeared safe to operate the vessel. In such cases, the prosecutor may argue that the witness's own judgment is compromised due to their history.

To avoid evidentiary issues or mistrials, prosecutors should consider filing a pretrial motion to determine whether the witness's prior offenses are admissible. Addressing this issue before trial ensures clarity and prevents surprises during testimony.

BUI TRIAL THEMES: UNIQUE CONSIDERATIONS FOR PROSECUTORS

In any criminal trial, framing the facts around a persuasive and cohesive theme is essential — but in BUI cases, crafting that theme requires special attention to the distinctive nature of boating, the marine environment, and the investigative process. A well-developed trial theme in a BUI case not only helps jurors understand the evidence but also bridges the gap between unfamiliar boating dynamics and familiar concepts of impairment and public safety. As prosecutors begin preparing for trial, developing a clear and consistent theme early in the process is a strategic step that not only shapes the narrative for the jury but also helps organize witness preparation, evidence presentation, and overall case strategy.

Unlike DUI cases, where jurors often have personal experience with driving and traffic laws, BUI cases involve less familiar terrain. Jurors may not understand how boats operate, what constitutes reckless behavior on the water, or why standard investigative procedures differ. Therefore, the trial theme must educate, contextualize, and persuade — all while remaining simple, direct, and memorable.

PROSECUTION THEMES: THE DANGERS OF IMPAIRED BOATING

The prosecution's objective is to show that the defendant operated a vessel while impaired, creating a risk to themselves and others. A compelling theme should emphasize recklessness, impaired judgment, and the heightened dangers of boating under the influence.

Theme Example: "Impairment on the Water Is No Different Than Impairment on the Road"

This theme draws a parallel between boating and driving, helping jurors understand that impairment in either setting can lead to serious consequences. It also allows the prosecutor to highlight the added complexity of operating a vessel, such as lack of lanes, unpredictable water conditions, and the absence of traffic signals.

The use of witness testimony, SFSTs and BAC results all support this theme. Officers can describe erratic navigation, unsafe speed, or failure to follow boating rules. These behaviors mirror DUI indicators and reinforce the theme of dangerous impairment. Poor performance on seated SFSTs can be tied directly to the defendant's inability to safely operate the vessel.

Prosecutors should explain why these tests are valid and necessary in the marine setting. A BAC at or above 0.08% provides scientific evidence of impairment. The theme should connect this data to the defendant's behavior and the risks posed on the water.

Overall, prosecutors should emphasize how the defendant's impaired operation endangered other boaters, swimmers, or passengers. This supports a broader narrative that impairment on the water is no different in terms of public safety and accountability.

ANTICIPATING DEFENSE STRATEGIES: FRAMING THE ISSUES FOR THE JURY

Prosecutors should be prepared for defense arguments that seek to minimize or explain away signs of impairment. Understanding these common themes allows prosecutors to proactively address them in *voir dire*, opening statements, witness examinations and closing arguments.

Common Defense Framing: "Mistakes, Not Malice — Impairment Not Proven"

This narrative suggests that the defendant's actions were due to environmental conditions or innocent errors rather than intoxication. Prosecutors should be ready to refocus the jury on the totality of the evidence and the legal standard for impairment.

For example, the defense may argue that officer observations were subjective and therefore unreliable due to water conditions or bias. Prosecutors should emphasize the training and experience of the officers, corroborating evidence, and consistency in observed behavior.

Defense may also claim that poor performance on the seated SFSTs was due to stress, physical limitations, or unstable surfaces. Prosecutors should explain the rationale behind marine-adapted SFSTs and how they are designed to isolate signs of impairment.

Also, if BAC results are borderline or delayed, defense may question their accuracy. Prosecutors should be prepared to explain the science behind alcohol absorption and elimination and address any procedural concerns with expert testimony.

Defense may point to environmental explanations such as rough waters, mechanical issues, or unfamiliarity with the area. Prosecutors should counter with evidence that the defendant's behavior was inconsistent with safe boating practices, regardless of conditions.

WHY BUI TRIAL THEMES MUST BE TAILORED

In BUI cases, the trial theme must do more than assert impairment — it must translate the unfamiliar into the familiar, helping jurors understand how boating differs from driving and why impairment in this context is equally dangerous. For prosecutors, the theme should emphasize public safety, the defendant's impaired judgment, and the consequences of operating a vessel under the influence. By anticipating defense strategies and reinforcing a clear, relatable narrative, prosecutors can guide jurors through the complexities of BUI cases and toward a just verdict.

PREPARING FOR VOIR DIRE

Once a trial theme has been developed during case preparation, prosecutors should begin planning to introduce that theme and reinforce throughout the trial — starting with jury selection. *Voir dire* is the first opportunity to shape jurors' understanding of the case, identify potential biases, and lay the foundation for your narrative.

As discussed earlier, given the common perception that impairment on the water is less serious than on land, prosecutors must be proactive in addressing this misconception. If you are in a jurisdiction that permits oral questioning by the prosecutor and defense, *voir dire* allows you to do more than just screen for impartiality — it enables you to begin educating jurors about the real dangers of BUI and to introduce your case theme and theory in a subtle but strategic way.

KEY OBJECTIVES DURING *VOIR DIRE*:

- **Identify Misconceptions:** Ask open-ended questions to uncover jurors who may believe boating is inherently less dangerous than driving, or who view alcohol or recreational drug use on the water as more socially acceptable.
- **Introduce the Theme:** Begin reinforcing your trial theme (e.g., "Impairment on the Water Is No Different Than Impairment on the Road") through carefully crafted questions that highlight the risks of impaired boating.

Photo Credit: iStock: IPGGutenbergUKLtd

- **Establish Credibility of Evidence:** Gauge jurors' attitudes toward field sobriety tests, BAC results, and law enforcement testimony in a marine context. This can help you anticipate challenges and tailor your presentation of evidence.
- **Build Rapport and Engagement:** Use this time to connect with jurors and frame the case as one that involves community safety, responsible behavior, and accountability.

SAMPLE QUESTIONS MIGHT INCLUDE:

- “How many of you have spent time on a boat or are familiar with recreational boating?”
- “Do you think operating a boat while impaired is as dangerous as driving a car while impaired? Why or why not?”
- “What are your thoughts on law enforcement conducting sobriety tests on the water?”
- “Have you ever heard someone say boating under the influence isn’t a big deal? What do you think about that?”

By using *voir dire* to surface attitudes and begin reframing the narrative around BUI, prosecutors can set the stage for a more receptive jury — one that is better prepared to understand and apply the evidence within the framework of your trial theme.

PREPARING WITNESSES FOR COURT

As with DUI cases, it is essential to meet with witnesses early, establish rapport, and address any questions they may have. Working through their testimony helps identify areas needing clarification or improvement, giving the prosecutor time to resolve these issues before trial.

Photo Credit: iStock: gorodenkoff

And, as with DUI cases, in a BUI case, the arresting officer is often the most critical witness. Preparation with the officer should include a thorough review of the officer's training, the case's theme and theory, relevant exhibits, facts and common defenses. Additionally, it is important to discuss the officer's experience on the water — particularly in boating enforcement and impaired operation investigations. Prosecutors, often managing heavy caseloads, may be tempted to rush through witness preparation. However, investing extra time with the arresting officer can uncover valuable information and help humanize them before the jury, thus enhancing their credibility.

For example, an officer who grew up in the area and spent significant time fishing, boating, or swimming on the waterway in question may have a deep familiarity with its nuances. This background can be used to demonstrate their understanding of boating and waterway norms beyond formal training. Developing this narrative can significantly bolster the officer's credibility — and by extension, the strength of the case.

Seated SFSTs

When the facts warrant doing so, the officer must be prepared to testify about their administration of the seated SFSTs. It is often effective to have the officer demonstrate these tests in court, but they should not be caught off guard. A practice run — ideally in the courtroom — ensures both the officer and prosecutor are comfortable with the logistics and presentation.

PREPARING WITNESSES FOR COURT

Prosecutors themselves should be well-versed in the seated SFSTs, including their development, validation, and the specific validated clues. This is especially important in jurisdictions where these tests may be unfamiliar. Opening statements offer an opportunity to educate the judge or jury and lay the foundation for the officer's testimony. This approach is only effective if the prosecutor is confident in their understanding of impaired boating enforcement.

Prosecutors themselves should be well-versed in the seated SFSTs, including their development, validation, and the specific validated clues.

During pretrial preparation, review the seated SFSTs with the officer. If the officer is not a certified seated SFST instructor, consider reviewing the arrest video with a seated SFST instructor to confirm proper administration. If issues arise, a joint meeting with the coordinator and officer can help identify and address potential vulnerabilities before trial.

On the stand, the prosecutor should establish the officer's training and experience with the seated tests. Avoid stipulating to training, as this can prevent the jury from learning about the tests and the officer's qualifications. These tests may be familiar to the officer but are likely new to the judge or jury.

If the officer is a certified instructor, use this opportunity to educate the court on impaired boating enforcement. An instructor should be able to explain the history and validation of the seated tests, demonstrate each test confidently, and identify validated clues. This preparation helps counter common defense strategies, such as portraying the tests as too difficult for sober individuals or irrelevant to safe watercraft operation.

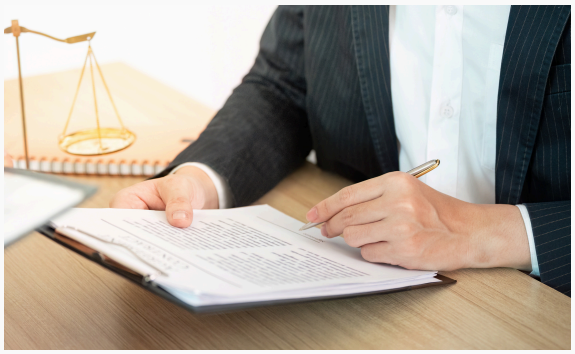
Photo Credit: National Association of State Boating Law Administrators

To rebut such claims, the officer should articulate the connection between test performance and boating safety. They can describe tasks involved in operating a vessel — steering, adjusting speed, and maintaining awareness of surroundings — and explain how those are divided attention tasks. The officer can then link these to the divided attention tasks involved in the psychophysical tests of the seated SFSTs; the Finger-to-Nose, Palm Pat, and Hand Coordination tests.

PRETRIAL MOTIONS

To avoid courtroom disputes over the admissibility of the seated SFSTs, prosecutors can proactively file a pretrial motion to admit testimony regarding these tests. Depending on the jurisdiction, this may be referred to as a *Motion in Limine or a Motion to Admit*. Unless seated SFST testimony is routinely accepted in the jurisdiction, it is reasonable to expect that the defense will challenge its admissibility — and potentially succeed if the issue is not properly addressed in advance.

In the motion, it is important to emphasize that the seated SFSTs are not novel. As noted earlier, they were developed by the SCRI — the same organization responsible for the standing SFSTs. The seated tests were created through a partnership between NASBLA and the U.S. Coast Guard, which funded SCRI's research and development, mirroring the role of NHTSA and the SCRI in the development of the standing SFSTs.



The motion should also highlight the scientific validity of the seated SFSTs. Specifically, when the minimum number of validated clues are observed across all four seated tests, there is a 91% likelihood that the subject has a BAC of .08 or higher. This accuracy rate is akin to the findings of the 1998 San Diego study on the standing SFSTs: *Validation of the Standardized Field Sobriety Test Battery at BACs Below 0.10 Percent*.[46] Given that roadside SFSTs are routinely deemed admissible in court, seated SFSTs — backed by comparable scientific rigor — should likewise be considered admissible when properly administered and documented.

To strengthen the motion, it is critical to attach supporting documentation, including:

- The original development studies of the seated SFSTs.
- The field validation study conducted at Lake of the Ozarks.[47]

These materials will help establish the reliability and relevance of the seated SFSTs, counter potential defense objections, and ensure the jury hears this important evidence.

[46] Stuster, J., & Burns, M. (1998, August). Validation of the Standardized Field Sobriety Test Battery at BACs Below 0.10 Percent. Santa Barbara, CA: Anacapa Sciences, Inc.
[47] Fiorentino et al., 2011.

SENTENCING AND REPORTING CONSIDERATIONS

When evaluating the terms of a plea offer or making a sentencing recommendation following a conviction at trial, prosecutors should consider several key factors. First and foremost, the defendant's criminal history must be reviewed. Whether or not prior convictions were introduced at trial, offenses such as BUI, DUI, or other substance-related crimes are highly relevant to determining an appropriate sentence.

In addition to the defendant's history, the prosecutor must be familiar with the sentencing provisions specific to their jurisdiction. Sentencing severity and post-conviction requirements vary widely from state to state.[48] Many courts also require certified copies of any prior convictions used for aggravation. If this applies in your jurisdiction, these documents should be obtained prior to trial, and any notice requirements should be met and provided to defense counsel.

Once the prosecutor understands the applicable minimum and maximum sentencing terms based on the defendant's history and local statutes, additional reporting requirements and aggravating factors should be considered. These may include:

- Substance abuse evaluations and recommended treatment
- Drug and alcohol testing
- Restrictions on vessel operation during any probationary period
- Custodial time based on case facts or criminal history
- Fines and community service, if required or appropriate

Aggravating factors that may justify a more severe sentence should also be evaluated. In addition to prior convictions, consider whether the incident involved:

- A crash or injuries
- Restitution owed
- The presence of children or vulnerable individuals

As with any other case, any victims should be consulted prior to making a sentence recommendation. When children or disabled persons are involved, the prosecutor should emphasize the increased risk posed by the defendant's behavior. These individuals may be unable to use flotation devices, recognize danger, or evacuate the vessel, which significantly heightens the threat to their safety.

[48] https://www.networkforphl.org/wp-content/uploads/2019/11/Summary-Boating-Under-the-Influence-State-Laws-6-27-19.

SENTENCING AND REPORTING CONSIDERATIONS

Some states have statutes that enumerate specific aggravating factors that increase punishment. For example, a high blood alcohol level or the presence of drugs may be used to enhance sentencing. Even in jurisdictions where this is not statutorily required, these factors should still be considered when recommending conditions such as increased testing or mandatory treatment.

The prosecutor should also account for any additional offenses committed during the BUI incident. The severity of these offenses may influence the overall sentencing recommendation.

Common examples include:

- Child abuse or endangerment
- Elder abuse or endangerment
- Violations of no-wake zones or speed limits
- Safety equipment violations
- Open container violations
- Possession of controlled substances or paraphernalia
- Underage alcohol consumption
- Discharging a firearm from a vessel
- Fishing without a license

Additionally, the prosecutor should understand the potential impact of a BUI conviction on the defendant's driver's license, boating license, and any passenger-for-hire privileges. These consequences vary significantly by state. Some jurisdictions impose vessel operation suspensions, ignition interlock requirements, or driver's license penalties, while others do not.[49] It is essential that the prosecutor be knowledgeable about the specific consequences in their state.

Finally, the prosecutor should be aware of jurisdictional and trial court-specific expectations and norms when crafting a sentencing recommendation. By carefully considering all relevant factors, the prosecutor can recommend a sentence that appropriately punishes the offense, communicates the seriousness of the conduct to the boating public, represents the interests of any victims, addresses underlying substance abuse issues, and protects public safety.

[49] Boating Under the Influence. State Boating Laws. (n.d.). https://www.uscgboating.org/regulations/state-boating-laws-details.php?id=27&amp%3Btitle

CONCLUSION

The enforcement and successful prosecution of any BUI case requires a coordinated team effort. Officers must thoroughly prepare each case, while prosecutors must ensure that all relevant evidence is clearly and effectively presented at trial. A strong working relationship between law enforcement and prosecutors is essential — and plays a critical role in reducing BUI-related injuries and fatalities. This collaboration not only strengthens public trust but also promotes safer waterways and saves lives. Sustaining this vital partnership depends on continued training, open communication, and mutual support, all of which contribute to more effective BUI enforcement and better outcomes.

[46] Stuster, J., & Burns, M. (1998, August). Validation of the Standardized Field Sobriety Test Battery at BACs Below 0.10 Percent. Santa Barbara, CA: Anacapa Sciences, Inc.
[47] Fiorentino et al., 2011.

RESOURCES & FUNDING ACKNOWLEDGMENT

National Association of State Boating Law Administrators. (2025). *Effective prosecution of boating while impaired (BWI) cases: Instructor manual* (Version 2025.2).

National Association of State Boating Law Administrators. (2025). *Effective prosecution of boating while impaired (BWI) cases: Participant manual* (Version 2025.2).

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APPENDIX

GLOSSSARY A - B

A

ACCIDENT (WEBSTER) – A happening that is not expected, foreseen or intended. An unfortunate occurrence or mishap, sudden fall, collision, etc. Usually resulting in physical injury.

AFLOAT – Waterborne; Supported on the water.

AGROUND - Touching or stuck on the bottom.

AIDS TO NAVIGATION - Charted objects available to assist in determination of position, safe course or to warn of danger (e. g. buoys, beacons, fog signals, lights, radio beacons, range marks). Also, electronic device used for navigation.

ANCHOR - Device used to secure boat to bottom of a body of water.

ANCHORAGE - Suitable or designated place where boats anchor.

ASSESSMENT – The initial phase of an incident investigation where damage is recorded for later analysis.

ASTERN - In back of or behind the boat, backward; opposite of ahead.

AT ANCHOR – Held in place in the water by an anchor; includes “moored” to a buoy or anchored vessel and “dragging anchor”.

B

BIIR – (Acronym) Boating Incident Investigation Report.

BASS BOAT – Low profile boat typically 16 to 19 ‘ with shallow deep vee hull and little above decks other than a console allowing for maximum fishing mobility.

BEACON - Anything that serves as a signal or indication for guidance or warning. A fixed (non-floating) aid to navigation.

BEAM - Maximum width of a boat. Also, a horizontal athwartship support for the deck.

BELOW - Beneath the deck.

BEYOND FIRST-AID – Injury that requires the services and/or facilities of a hospital or hospital emergency room.

BILGE - Lowest part of a boat's interior.

BLA - (Acronym) Boating Law Administrator.

BOARDING – Common term used to indicate a vessel inspection, usually accomplished by an officer going aboard a vessel to be inspected.

BOW - Forward end of a boat.

BULKHEAD - Vertical partition separating compartments in a boat. May be watertight.

BULWARK - Portion of hull extending above the deck.

BUOY - Anchored floating device used as an aid to navigation. May carry a light, horn, whistle, bell, gong, or combination for identification. Also may be used to mark a mooring (i. e., anchor buoy).

BUOYANCY - The upward force that keeps a boat floating.

BURDENED VESSEL – Former term for vessel required to stay clear of a second vessel having the right of way.

C

CABIN - The enclosed or decked-over living space of a boat.

CABIN MOTORBOAT – Motorboat with a cabin which can be completely closed by means of doors or hatches. Large motorboats with cabins, even though referred to as yachts, are considered to be cabin motorboats.

CANOE – Narrow, round-bottom, manually propelled watercraft.

CAN BUOY – A cylindrical buoy, generally green, marking the left side of a channel or safe passage as seen entering from seaward.

CAPACITY PLATE – Manufacture required information label providing maximum horse power and weight carrying limits displayed in view of operator.

CAPSIZE - To turn over, upset.

CAPSIZING – Overturning a vessel. The bottom must become uppermost, except in the case of a sailboat, which lays on its side.

CARBON MONOXIDE (CO) – A gas formed by the combustion of one molecule of carbon and one molecule of oxygen. Commonly referred to as a byproduct of the combustion process of an internal combustion engine.

CARDINAL MARKS (POINTS) – Indicate the location of navigable waters by reference to the cardinal directions (N,E,S,W,) on a compass.

CARRY AWAY - To break free and become lost.

CARVEL - Smooth-planked hull construction.

CASP - (Acronym) Computer-Aided Search Planning.

CAST OFF - To let go a line.

CATAMARAN - Boat with twin, narrow hulls connected by a deck or crossbeams resulting in a wide beam and good stability.

CATBOAT - Sailboat with a mast stepped near the bow, and no jib.

CATHEDRAL HULL – Tri-hull type vessel with the center hull being predominate.

CAVITATION - A partial vacuum created in the water around a rapidly revolving propeller which loses contact with the water in which it is turning.

CELSIUS - A temperature scale (formerly called centigrade) on which 0 represents the freezing point of water and 100 the boiling point at standard pressure (1,013 millibars). Formula for converting to Fahrenheit: F = (9/5)C + 32.

CENTER OF BUOYANCY - The center of gravity of the water displaced by a floating boat.

CENTER OF GRAVITY - The point from which a body could be freely suspended without rotating in any direction. In a vessel, that point where the sum of all moments of weight is zero.

CENTERBOARD - Hinged board that can be lowered through a slot in the keel to reduce leeway.

CENTERLINE - Fore-and-aft imaginary line that runs along the exact center of a boat.

CERTIFICATE OF INSPECTION – CERTIFICATE OF NUMBER – Document issued by state authorities containing the registration number, vessel and owner/operator information. Must be carried on board and be presented for inspection upon request by any law enforcement officer.

CFR - (Acronym) Code of Federal Regulations

CHARACTERISTIC – The audible, visual, or electronic signal displayed by an aid to navigation to identify it specifically or generally as to type of aid to navigation.

CHART – A printed or electronic geographic representation generally showing depths of water, aids to navigation, dangers, and adjacent land features useful to mariners.

CHECK VALVE - A gate or valve which allows passage of gas or fluid in one direction only.

CHINE - Line formed by intersection of sides and bottom of a boat. See HARD, SOFT and REVERSE CHINE.

CHINE WALKING – A condition of instability created by speeds in excess or the hull design limits where by a vessel will rock from one side of vessel's bottom to the other.

CLOSING – The act of one vessel reducing the distance between another vessel, structure, or object.

COAST GUARD APPROVED – Label denoting compliance with US Coast Guard specifications and regulations relating to performance, construction, and materials.

COASTAL – At or near the coast.

COCKPIT - Well or sunken space in the deck.

COLLISION – The striking together of two bodies in motion.

COLLISION WITH ANOTHER VESSEL – Any striking together of two or more vessels regardless of operation at the time of the incident. A vessel does not have to be underway to be involved in a collision. (Also includes colliding with the tow of another vessel, regardless of the nature of the tow, i.e., surfboard, skier, tow line, etc.)

COLLISION WITH A FIXED OBJECT – The striking together of a vessel with any fixed object, above or below the surface of the water.

COLLISION WITH A FLOATING OBJECT – collision with any waterborne object above or below the surface that is free to move with the tide, current, or wind, except another vessel.

COMMS - (Acronym) Communications.

COMPANIONWAY - Stairway or ladder leading below from deck.

COMPARTMENT – A room or space within a vessel.

COMPASS – Instrument for determining direction: magnetic, relying on the Earth's magnetic field; gyroscopic, relying on the tendency of a free - spinning body to align its axis with that of the Earth.

COMPASS CONVERSION - A standard system employed to convert True values to Compass values, and vice versa, by the addition or subtraction of variation and deviation.

COMPASS COURSE - The course by boat's compass. The angle between the boat's keel and the north point of the compass card when the boat is on course.

COMPASS ERROR - Combined effect of variation and deviation.

CONSTRUCTIVE TOTAL LOSS – A condition of a vessel when the damage, salvage and cost to repair exceeds their value after salvage.

CONTUSION – Injured tissue characterized by bruising and swelling, and possible hematoma (bluish lump caused by blood clot) if large vessels are torn beneath the skin.

COURSE - The direction in which a boat is steered.

COURSE OVER GROUND (COURSE MADE GOOD) - Actual direction of travel of a boat over the bottom.

COURSE STEERED - The direction in which the bow of the boat is pointed when underway.

CRASH STOP – The act of shifting a vessel's propulsion gear from full ahead to full astern. An emergency maneuver. It is an extremely harsh act which can cause severe damage to the drive train and may cause engine stall.

CRIMINAL NEGLIGENCE – A person fails to be aware of a substantial and unjustifiable risk that circumstances exist or a result will follow and such disregard constitutes a gross deviation from the standard of care which a reasonable person would exercise in the situation.

CRUISING – Proceeding normally, unrestricted, with an absence of drastic rudder or engine changes.

CUDDY - A shelter cabin in a small boat.

CULPABLE – Deserving blame.

CULPABLE MENTAL STATE – The degree of conduct or blame by a person which will then determine the extent of their criminal liability.

CURRENT - The horizontal movement of water; the movement of electrons through a conductor.

CUTTER - A single-masted boat with mainsail and usually more than one headsail, with the mast stepped close to amidships (from 40% to 50% aft of the bow versus 33% for a sloop).

D

DAGGER BOARD - Sliding board that can be lowered through the keel to reduce leeway; centerboard.

DAMAGE CONTROL – Measures necessary to preserve and reestablish watertight integrity, stability, and maneuverability aboard a vessel. Temporary in nature.

DATUM - The reference plane from which depths of water are measured and recorded on charts (as "charted depths" or IV soundings") and, in coastal waters, to which height of tide is added algebraically to determine depth of the water.

DAYBEACON - Unlighted fixed aid to navigation.

DEAD IN THE WATER (DIW) – A vessel that has no means to maneuver, usually due to engine failure.

DEAD RECKONING (DR) - Calculating a boat's position based on its course, speed, and time run from a previous position.

DEADRISE - The angle made by the horizontal plane of the keel to the boat bottom.

DEBRIS FIELD – Usually consisting of small pieces of fiberglass, glass and other particles strewn throughout an area on a boat. May also be found on the bottom where the incident occurred and may be necessary to document by divers to complete investigation.

DECK – The horizontal plating or planking on a ship or boat; Nautical for floor.

DEGLOVING AMPUTATION – An injury resulting in the skin and fatty tissue being torn away but underlying tissue and bone is left intact.

DEPRESSION – (Collision Dynamic) Tendency of an impacted boat to be forced down into the water as it responds to the downward force of the striking boat.

DINGHY - Small open boat used as a tender or lifeboat.

DISPLACEMENT - The weight of water displaced by a floating vessel; hence, the weight of the vessel itself.

DISPLACEMENT HULL - A hull that maintains its full displacement of water whether at rest or moving at various speeds (as opposed to a planing hull that generally decreases its displacement with increased speed).

DISTRESS – As used in marine applications to mean when a vessel or person is threatened by grave or imminent danger requiring immediate assistance.

DISTRESS CALL - See "MAYDAY.

DIW - (Acronym) Dead in the Water.

DMB - (Acronym) Datum Marker Buoy.

DOCK - Area of water in which a boat rests between two landing piers or wharves.

DOCUMENTED YACHT – A vessel of five or more net tons owned by a citizen of the United States and used exclusively for pleasure with a valid marine document issued by the Coast Guard. Documented vessels are not numbered.

DOWNBURST - A strong downdraft that induces an outburst of damaging winds at or near the surface of the earth.

DOWNDRAFT - A downward current of air, comparatively strong and limited in horizontal extent, commonly found within thunderstorms and other areas of atmospheric turbulence; a type of carburetor in which the fuel-air mixture flows downward to the engine.

DRAG – Forces opposing direction of motion due to friction, profile and other components.

DRAFT - Depth of water needed to float a boat. Measured from the waterline of a vessel.

DRIFT - Movement of a boat due to wind and current; velocity of current.

DRIFTING – Underway, but proceeding over the bottom without use of engines, oars or sails; being carried along only by tide, current, or wind.

DRIZZLE - Precipitation consisting of numerous tiny droplets, sometimes called mist.

E

EBB CURRENT - A tidal current in which the flow of water is generally away from the major land mass and towards the open sea. (Often incorrectly termed "ebb tide.")

EDDY - A small whirl, or circling movement of water, embedded within a larger current.

ELEVATOR - A wedge, either attached to or built into the bottom of a vessel, for the purpose of keeping its stern up when underway. Called "trim tabs" when adjustable.

ELT - (Acronym) Emergency Locator Transmitter.

EMBARK - To go aboard.

EMERGENCY LOCATOR TRANSMITTER (ELT) – Aeronautical radio distress beacon for alerting and transmitting homing signals.

ENVIRONMENTAL FORCES – Forces that affect the horizontal motion of a vessel; they include wind, seas and current.

ENVIRONMENTAL PROTECTION AGENCY (EPA) – Federal agency charged with administering rules and regulations involving the environment, i.e., oil pollution.

EPA – (Acronym) Environmental Protection Agency.

EPIRB - (Acronym) Emergency Position Indicating Radio Beacon - A small transmitter operating on aircraft or marine emergency channels used in cases of distress.

ESTIMATED POSITION (EP) - Most probable position of a boat based on a single LINE OF POSITION (LOP) or based on incomplete or questionable data.

ETA - (Acronym) Estimated Time of Arrival.

EVEN KEEL - A boat is on an even keel when it is floating level.

EXIT POINT – (Incident) Location on a vessel where both boats last had contact.

F

FAIRWAY - Navigable channel in a body of water.

FALLEN SKIER – A person who has fallen off their water skis.

FALLS OVERBOARD – Anytime a person unintentionally enters the water from any portion of a vessel.

FAST - Secure: to make something fast is to secure it.

FASTENINGS - Screws or nails that are used to hold parts of a boat together.

FATHOM - Nautical linear measurement equal to 6 feet.

FATIGUE – The failure or mechanical properties after repeated application of stress

FAULT OF OPERATOR – Speed; overloading; improper loading, not properly seating occupants of boat; no proper lookout; carelessness; failure to heed weather warnings; operating in a congested area; not observing the Rules of the Road; unsafe fueling practices; lack of experience; ignorance of aids to navigation; lack of caution in an unfamiliar area of operation; improper installation or maintenance of hull, machinery or equipment; poor judgment; recklessness; overpowering the boat; panic; proceeding in an unseaworthy craft; operating a motorboat near persons in the water; starting engine with clutch engaged or throttle advanced; irresponsible boat handling such as quick, sharp turns.

FEDERAL BOAT SAFETY ACT – (1971) Established minimum safety standards for boats and associated equipment, provides for numbering of undocumented vessels, established the “Boating Safety Advisory Council” and authorized financial assistance to states for boating safety programs.

FENDER - Protective device between a boat and another object.

FETCH - The unobstructed distance over the water on which the wind may act to build wind waves.

FIBERGLASS – See Fiber Reinforced Plastic.

FIBER REINFORCED PLASTIC – Hulls of Fiber Reinforced Plastic. The laminate consists of two basic components, the reinforcing material (glass filaments) and the plastic or resin in which it is embedded.

FIRE/EXPLOSION (FUEL) – Accidental combustion of vessel fuel, liquids, including vapors, or other substances, such as wood or coal.

FIRE/EXPLOSION (OTHER) – Accidental burning or explosion of any material on board except vessel fuels or their vapors.

FISH WELL – A formed or molded recess in a vessel's deck or structure intended for fish storage. May double as gear storage. Not to be confused with a BAIT WELL or LIVE BAIT TANK.

FITTING – Generic term for any part or piece of machinery or installed equipment.

FIX - Relatively accurate position determined without reference to any former position. Usually determined by nearness to a known charted object or by crossed lines of position.

FIXED LIGHT – A light showing continuously as opposed to a rhythmic light.

FLARE - Outward curve of the hull towards the deck; a visual distress signal.

FLASH – A relatively brief appearance of light, in comparison with the longest interval of darkness in the same character.

FLAT BOTTOM BOAT – Any vessel with a flat, or nearly flat bottom; typically small jon boats or punt boats.

FLATWATER CANOEING – Term used for canoeing on lakes, reservoirs, slow moving rivers and other relatively calm bodies of water. May include day rentals on a lake to multi-day journeys down a gentle river.

G

GEAR - General name for all non-permanent nautical equipment, including crew's clothing and personal effects.

GEAR RATIO - The number of revolutions made by a driving gear compared to the number made by a driven gear of different size.

GELCOAT - The outside color coat used in fiberglass construction.

GENERATOR - Similar to an alternator with a wound coil rotor but provided with a commutator to obtain direct current output.

GENOA JIB - A large overlapping headsail.

GEOGRAPHICAL POSITION (GP) - A point on the earth's surface aligned with the center of the earth and a body's position on the celestial sphere.

GIVE-WAY BOAT (BURDENED) - One that does not have the right-of-way and should avoid the stand-on boat.

GLOBAL POSITIONING SYSTEM (GPS) – A satellite-based radio navigation system that provides precise, continuous, worldwide, all-weather three-dimensional navigation for land, sea and air applications.

GOUGE – A deep scratch extending through the gel coat but not entirely through the fiberglass material.

GOVERNOR - A device to regulate or control engine speed, regardless of the load. It may be mechanical, hydraulic or electrical.

GPS - (Acronym) Global Positioning System.

GREAT LAKES RULES OF THE ROAD – See Inland Rules of the Road.

GREENWICH MEAN TIME (GMT, UT) - Zone time at the Greenwich meridian. Greenwich hour angle of the mean sun.

GROUND SWELL - Steepening and increasing severity of ocean swells as they cross a shallow area such as a reef or bar.

GROUNDING – Bringing a vessel's keel into contact with the bottom so that it ceases to be completely waterborne; connecting by a conductor to a point of zero potential, such as the Earth.

GUNWALE - Upper edge or rail of a boat. (Pronounced "gun'el")

GUST - A sudden brief increase in wind speed.

H

HEADING - Direction in which a boat is pointing at a given moment.

HEADS UP - A warning given to alert people of an impending hazard; an alert to indicate readiness to receive a heaving line.

HEADWAY - Boat's forward momentum.

HEEL - Incline to one side due to force of wind or waves, or by high-speed turn.

HEIGHT OF TIDE - The vertical distance between the surface of tidal water at a given moment and the datum (reference plane) from which depths are measured and recorded on charts of the area. Values may be + or - and are added algebraically to the charted depth to give the depth of water.

HELM - The tiller or wheel and related steering gear.

HELMSMAN - The one who steers the boat with the tiller or wheel.

HIDDEN HIN – See secondary HIN.

HIN – (Acronym) Hull Identification Number.

HOLED – Refers to a hole or opening in the hull of a damaged vessel.

HOME BUILT BOAT – Vessel having an Assigned Hull Identification Number.

HORSEPOWER - (HP) The amount of power or the rate of doing work. One electrical horsepower equals 746 watts.

HOUSE BOAT – Cruising yacht whose superstructure is larger and designed more for living aboard as well as smaller vessels that appear to have evolved f rom land trailers and mobile homes. Such vessels generally sacrifice some degree of seaworthiness in exchange for creature comforts; Floating homes semi-permanently moored to piers or wharfs with no independent means of propulsion.

HULL - Basic structure and shell of a boat.

HURRICANE - A tropical cyclone with wind speeds of 64 knots or greater.

HURRICANE SURGE - A sudden rise in the level of the sea along a coast line as a result of the approach and passage of a hurricane. See STORM SURGE.

HYDROFOIL - A device designed to deflect a water stream thereby generating a force from it (e.g. rudder, keel, centerboard). Also, a vessel designed to have its hull raised clear of the water when moving at high speed.

HYPOTHERMIA – The physical condition in which the human body loses heat faster than it can produce it; severe cases may result in death.

I

IAAI - (Acronym) International Association of Arson Investigators.

IAMI - (Acronym) International Association of Marine Investigators.

ICE - Water in its solid form.

ICS - (Acronym) Incident Command System.

IDLE SPEED – A slow speed consistent with vessel being in gear and engine running at lowest RPM; Click Speed.

IMPRESSION – Imprint of a hard object into the hull or surface of another object.

IMPROPER LOADING – Loading, including weight shifting, of a vessel causing instability, limited maneuverability, or dangerously reduced freeboard.

IMPROPER LOOKOUT – No proper watch; the failure of the operator to perceive danger because no one was serving as lookout, or the person so serving, failed in that regard.

INBOARD - Toward the centerline of the boat; inside the boat.

INBOARD-OUTBOARD (I/O) - Propulsion system consisting of an inboard engine connected through the transom to an outboard drive unit. Also known as an Inboard - Outdrive. Vessel may also be considered an Inboard because the power unit is located inside the boat.

INCIDENT: an event or occurrence.

INCIDENT COMMAND SYSTEM (ICS) –Management system for responding to major emergencies involving multiple agencies and jurisdictions.

INCISION – Injury resulting in a sharp cut with smooth edges. If the wound is deep, large blood vessels, nerves and tendons may be severed, resulting in great danger to victim due to severe blood loss.

INLAND RULES OF THE ROAD – Result of an act by Congress that unified the previously separate Inland, Great Lakes, and the Western Rivers Rules effective 12/24/81 (Great Lakes 3/1/83).

INTERNATIONAL ASSOCIATION OF MARINE INVESTIGATORS (IAMI) – Organization comprising members from the Marine Insurance Industry, Public Sector Marine Law Enforcement and Marine Surveyors and Engineers to address problems associated with marine arson, fraud and theft.

J

JET SKI – Common term used to describe Personal Watercraft. “Jet Ski” is a trade mark of the Kawasaki Corporation used to identify a stand-up variety of PWC.

JON BOAT – A small lightweight nearly flat-bottomed boat with a broad transom and usually squared-off bow.

K

KAPOK – A silky fiber obtained from the fruit of the silk-cotton tree and used for buoyancy, insulation and as padding in seat cushions and life preservers.

KAYAK – Round bottomed, manually propelled small watercraft.

KAYAK TOURING – Also known as sea kayaking, this activity includes diverse experiences such as day trips on lakes, multi-day excursions, and kayaking on open oceans. Touring kayaks are typically long and sleek, feature storage compartments, and are designed for speed and efficiency.

L

LACERATION – A tear or jagged cut in the skin that produces a ragged incision in the skin surface and underlying tissue.

LATERAL SYSTEM – A system of aids to navigation in which characteristics of buoys and beacons indicate the side of the channel or route relative to a conventional direction of buoyage (usually upstream).

LIGHT BUOY – Floating framework aid to navigation, supporting a light. Usually supported by a battery.

LIGHT LIST – A United States Coast Guard publication that provides detailed information on Aids to Navigation.

LINE OF POSITION - A line, usually plotted on a chart, along which the boat lies, as determined from a single observation. Also, a visual or electronic reference line from, or about, a known navigational aid.

LINE OF SIGHT - Line of direct visual observation from one point to another.

LIST - Inclination of a boat to one side due to weight distribution.

LKP - (Acronym) Last Known Position

LOA - (Acronym) Length Overall.

LOCAL NOTICE TO MARINERS – A written document issued by Coast Guard districts to disseminate important information affecting aids to navigation, dredging, marine construction and special marine activities or events in a particular district.

LOOKOUT – A person stationed as a visual watch.

LORAN – (Long Range Aid to Navigation) An electronic navigation system for establishing lines of position by utilizing the time difference between the reception of signals from different locations.

M

MANEUVERING – Changing course, speed, or similar boat handling action during which a high degree of alertness is required or the boat is imperiled because of the operation, i.e. docking, mooring, undocking, etc.

MARINE SURVEYOR – An individual who performs detailed inspections (surveys) of boats and ships to determine the condition of hull, equipment, and machinery.

MARITIME – Located on or close to the sea; Connected with shipping or navigation.

MARITIME LAW – Law relating to shipping, seaman, navigation and harbors.

MARITIME LIENS – Legal right of a ship's master and seaman to have a ship held as security for wages unpaid. Takes precedence over any other lien on the ship.

MAYDAY - The international radiotelephone procedural word for distress. It indicates immediate danger to a vessel or to someone on board and is the highest priority transmission.

MODIFIED-VEE HULL – A hull type characterized by a sharp or deep entry at the bow, gradually lessening to flat or nearly flat bottom at the stern.

MOORING - Permanent ground tackle to which a boat is attached or moored.

MOTOR - A rotating machine which converts electrical energy into mechanical power.

MOTOR BOAT – Any vessel equipped with propulsion machinery, not more than sixty-five feet in length.

MOTOR VESSEL – Any vessel equipped with propulsion machinery (other than steam) more than sixty-five feet in length.

MOU – (Acronym) Memorandum of Understanding.

MULTI-HULL – A vessel with two or more hulls.

N

NAMS - (Acronym) National Association of Marine Surveyors.

NASBLA - (Acronym) National Asociation of State Boating Law Administrators.

NATIONAL ASSOCIATION OF STATE BOATING LAW ADMINISTRATORS – Professional organization consisting of state, commonwealth and provisional officials responsible for administering and/or enforcing state boating laws.

NATIONAL TRANSPORTATION SAFETY BOARD (NTSB) – An independent federal agency dedicated to promoting aviation, railroad, highway, marine, pipeline, and hazardous material safety by investigating incidents to determine probable cause and issuing safety recommendations. The NTSB makes its actions and decisions public through reports, studies, and safety recommendations.

NAUTICAL MILE (NM) - A unit of distance equal to one minute of latitude and approximately equal to 6,076.7 feet, or 1.15 statute miles.

NAVIGABLE WATERS – Coastal waters, including bays, sounds, rivers, and lakes that are navigable from the sea; waters upon which interstate commerce is or has been conducted in the past.

NAVIGATION – The art and science of locating the position and plotting the course of a ship or aircraft.

NEGLIGENT – A person fails to be aware of a substantial and unjustifiable risk that circumstances exist or a result will follow and such disregard constitutes a gross deviation from the standard of care which a reasonable person would exercise in the situation.

NTSB – (Acronym) National Transportation Safety Board.

NUMBERED VESSEL – An undocumented vessel numbered by a state with an approved numbering system or by the Coast Guard under Chapter 123 of Title 46, U.S.C.

NUN BUOY (CONICAL) – Buoy that is cylindrical at the waterline, tapering to a blunt point at the top. Lateral mark is red, even-numbered, and usually marks the port side proceeding to seaward.

NVG - (Acronym) Night Vision Goggles.

O

OAR – A long, wooden, paddle-like instrument used to propel small boats.

O/D - (Acronym) Overdue in search and rescue, or overdose in medical applications.

OFFSHORE - A direction away from the shore.

ON SCENE – The search area or actual distress site.

ON SCENE COMMANDER (OSC) – A person designated to coordinate search and rescue operations within a specified area associated with a distressed incident.

OPEN MOTORBOAT – Craft of open construction specifically built for operating with a motor, including boats canopied or fitted with temporary partial shelters.

O/S - (Acronym) On Scene.

OSC - (Acronym) On Scene Commander.

OSHA – Occupational Safety and Health Administration.

OUTBOARD MOTOR - An engine with a propeller attached, not permanently affixed to the structure of the craft, regardless of the method or location used to mount the engine (e.g., motor wells, “kicker pits,” motor pockets, etc.).

OUTRIGGER CANOEING – This traditional South Pacific style of canoeing uses a canoe equipped with an outrigger. The outrigger canoe is highly stable and is commonly used for recreation and ocean racing.

OVERDUE – Term used when a vessel or person has not arrived at a time and place expected.

P

PADDLE – Flat-bladed device used to manually propel a small boat or canoe.

PATH OF ENGAGEMENT – The damage area between the initial point of contact and the exit point or last point of engagement.

PERSONAL WATERCRAFT – Crafts less than sixteen feet designed to be operated by a person or persons sitting, standing or kneeling on the craft rather than within the confines of a hull.

PERSONS ON BOARD – The number of persons aboard a vessel.

PFD – (Acronym) Personal Flotation Device.

PIER - Structure extending into the water from shoreline to provide dockage.

PILE - A pole or post driven vertically into the bottom, usually to support a pier or float or to moor a boat.

PILING – A long, heavy timber driven into the seabed to serve as a support for an aid to navigation or a dock. A structure of piles often used to protect wharves and piers.

PLOWING (SPEED) – Motion through the water with bow-heavy trim (bow-down). Transition speed between displacement speed and vessel being on plane.

PONTOON (BOAT) –Buoyant tube construction supporting primary vessel structure.

PORT - Left side of a boat when facing the bow. Also, toward the boat's left. Also, opening in a boat's side, (e.g., portlite). Also, harbor. Also, in engines, the openings in the cylinder block for valves, exhaust and inlet pipes, or water connections; in two-cycle engines, openings for inlet and exhaust purposes.

PORT TACK - Any heading where the wind is on the port side and the mainsail is carried on the starboard side of the boat.

PRAM - Flat-bottomed dinghy with blunt bow.

PROP CUTS - Created by the propeller of the impacting boat. Cuts may be clean, curved, cupped or diagonal as compared to visible skeg line cut. May be seen as a series of parallel cuts across a surface.

PROP WASH – The result of the propeller blade at the top of the arc transferring energy to the water surface.

PROPELLER - A multi-bladed, rotating wheel which furnishes propulsion.

PROPELLER SHAFT - Shaft which transmits power from engine and transmission to propeller.

PWC – (Acronym) Personal Water Craft.

R

RADIO BEACON - An electronic aid to navigation of known position emitting coded radio signals for use by shipboard Radio Direction Finders.

RADIO DIRECTION FINDER (RDF) - A radio receiver equipped with a compass rose and a loop or other type of directional antenna to determine the direction of the source of a received signal.

RAIL - A boat's side above the deck line.

RAMPING – (Collision Dynamic) The tendency of a striking vessel to become airborne due to the “ramp” created by the vessel being struck. May be an indication of high speeds on the part of the striking vessel. Ramping more likely to occur in impact with low profile vessels.

RECKLESS – A person consciously disregards a substantial and unjustifiable risk that circumstances exist or a result will follow and such disregard constitutes a gross deviation from the standard or care, which a reasonable person would exercise in the situation.

RECREATION – For pleasure; to use a vessel for recreational purposes.

RECREATIONAL BOATING SAFETY (RBS) – Specialist appointed in each Coast Guard district to coordinate Boating Safety activities involving the Coast Guard Auxiliary and state boating programs.

RED, RIGHT, RETURNING - Saying used to remember which aids you should be seeing off vessel’s starboard side when returning from seaward.

REGISTERED VESSEL – A numbered vessel under the Federal Boat Safety Act of 1971; any mechanically propelled vessel, regardless of horsepower, used on waters subject to federal jurisdiction, other than foreign, documented, and government vessels, as well as tenders and lifeboats.

REGISTRATION – Also known as the Certificate of Number. Issued by government authority and required to be aboard vessel at all times with the exception of rental craft.

REGULATIONS – Mandatory requirements for the construction of vessels and/or vessel components; allows for manufacturer self-certification for most regulations.

RIGHT OF WAY – The right and duty of a vessel to maintain course and speed when encountering another vessel under the Rules of the Road.

RIGGING – General term applied to all lines (ropes) aboard a vessel.

ROLL – Vessel motion caused by a wave lifting up one side of the vessel, rolling under the vessel and dropping that side, then lifting the other side and dropping it in turn; Rotation around a longitudinal axis.

RULES OF THE ROAD – A set of statutory requirements enacted by Congress to promote the safety of navigation.

S

SAILBOAT OR AUXILIARY SAILBOAT – Craft intended to be propelled by sail, regardless of size or type.

SALVAGE – The saving of a vessel and/or its cargo from extraordinary danger; compensation or reward given for saving of property in danger.

SALVAGE AGREEMENT – Document by which recompense for salvage services is agreed upon.

SAP - (Acronym) Search Action Plan.

SAR - (Acronym) Search and Rescue.

SAR MISSION COORDINATOR (SMC) – The official temporarily assigned to coordinate response to an actual or apparent distress situation.

SARSAT – (Acronym) Search and Rescue Satellite-Aided Tracking.

SART - (Acronym) Search and Rescue Transponder.

SATNAV - Electronic navigation system using orbiting satellites to determine a vessel's position. Coverage is worldwide.

SCHOONER - A vessel with two or more masts rigged fore-and-aft.

SCRATCHES – Marks or scrapes on the surface of, but not through the gel coat.

SKEG - An extension of the keel, or a keel-like projection at the aft end of the hull, for protection of propeller and rudder.

SKEG LINE CUT – Vertical line cut in the side of a boat after being struck by the skeg of the impacting boat as it passes through.. Will often be seen extending out from the bottom of a Torpedo hole. May also be seen as a linear gouge or cut along the path of engagement in the impacted boat.

SKI – A flat planning device on which a water skier rides; Slang term used to indicate a PWC.

SKIER MISHAP – Any incident involving person or persons being towed behind a vessel on, but not limited to, any water ski, aquaplane, kneeboard, tube, or other similar device.

SKIFF – Small, lightly built boat intended for use in protected waters propelled by oars or sail.

SOUND SIGNAL – A device that transmits sound, intended to provide information to mariners during periods of restricted visibility and foul weather; a signal used to communicate a maneuver between vessels in sight of each other.

STANDARDS – Voluntary and recommended practices for construction of vessels and vessel components, i.e. ABYC and UL Standards.

STAND-ON VESSEL (Privileged) - The vessel with the right-of-way in a crossing situation which normally must maintain her course and speed.

STARBOARD - Side of a boat, or direction to the right when facing toward the bow.

STEEL HULL - Hulls of steel or steel alloy, not those with steel frames and wood, canvas or plastic hull coverings.

STEERAGEWAY - Enough speed to steer the boat.

STERN - After end of a boat.

STOKES LITTER – A rescue device generally used to transport non-ambulatory persons or persons who have injuries that might be aggravated by other means of transportation.

STORM SURGE - A great dome of water, often 50 miles wide, that comes sweeping across the coastline near the area where the eye of a hurricane will make landfall. This abnormal rise of the sea is primarily due to the winds of the storm.

STRAND - To drive a vessel ashore or aground. Also, one of the lays of a rope (the wound yarns or fibers that are woven with other strands to make a rope).

STRESS FRACTURE - Resembling spider webbing. Normally visible in gel coat adjacent to impact area and radiating out from the area of impact.

STRUCK BY PROPELLER – Anytime a person or persons outside the boat, but not necessarily a swimmer, is struck by any component of a vessel's undercarriage, including but not limited to propellers, rudders, outdrives, struts, and stabilizer fins.

SWELL - A wave system that has outrun or is no longer being acted upon by the wind that created it. A swell is characterized by regular, smooth-crested wave forms, usually of long wavelength.

T

TEAK SURFING - A highly dangerous act whereby a person or persons trail behind a slowmoving, typically inboard vessel, while holding onto the swim platform. This activity carries an extreme risk of carbon monoxide poisoning.

TEARING BRAKES - A break in fiberglass where separation has occurred and there is a tearing or ripping effect to the structure. Damage is usually spread out over a large area.

TIDAL CURRENT - The horizontal movement of water caused by tidal action. See also EBB CURRENT and FLOOD CURRENT.

TIDAL RANGE - Difference in height of tide between any successive pair of high and low tides.

TIDE - The vertical rise and fall of ocean water (most noticeable in coastal regions) resulting mainly from the gravitational attraction of the moon and sun.

TILLER - A lever attached to the upper end of a rudder stock, used by the helmsman to turn the rudder.

TIME OF ENGAGEMENT – The interval from initial contact till vessel separation in an incident.

TOPSIDES – The sides of a vessel between the water line and the deck.

TORPEDO HOLE - Circular hole or indentation in hull of impacted boat created by gear case of the lower unit of impacting boat.

TOWING - Engaged in towing any vessel or object, other than a person.

TRANSFER MARKS - (Evidence) Transfer of material from one boat or object to another, samples of which may be collected as evidence.

TRAUMATIC AMPUTATION - Injury resulting in the removal of body limbs or appendages as a result of crushing or tearing force.

TRIM - To adjust the set of the sail. Also, refers to the attitude of a boat at rest in the water.

TROLLING - Troll method of fishing.

TROLLING MOTOR – Small outboard motor, gas or electric, used to maneuver a vessel at slow speeds typical for troll fishing. Also known as a kicker motor.

TUNNEL HULL – Similar to a catamaran hull, except the two hulls are completely joined, with only a raised portion between them.

U

UNDER POWER - A sailboat being propelled by an engine even though sail may be set.

UNDERWAY - Making progress through the water; also afloat but not at anchor, aground, nor made fast to the shore.

UNIFORM STATE WATERWAY MARKING SYSTEM (USWMS) – Designed for use on lakes and other inland waterways that are not portrayed on nautical charts.

USCG - (Acronym) United States Coast Guard.

V

VESSEL - Includes every description of watercraft used or capable of being used as transportation on the water, other than a seaplane.

Development of Sobriety Tests for the Marine Environment

Dary D. Fiorentino, Bergetta M. Dietel, and Dulcemonica D. Jimenez

Six seated tests were evaluated in the laboratory to determine whether they would be feasible for use on the water as sobriety tests to measure impairment from alcohol at blood alcohol concentrations (BACs) of ≥0.08%. The standardized field sobriety tests (SFSTs) currently used at roadside are not suitable for the marine environment; marine law enforcement officers are left with insufficient methods to assess impairment on the water. One hundred fifty-seven participants were randomly assigned to a BAC group: 0.00%, 0.04%, 0.08%, and 0.12%. Six tests were administered to the participants by experienced law enforcement officers. Neither the testers nor the participants were privy to the participants' BACs. A variable called BAC status ($N = 138$) was obtained by dividing the average BAC into two groups: BAC < 0.08% and BAC ≥ 0.08%. A combination of four tests—horizontal gaze nystagmus (HGN), finger to nose (FTN), palm pat (PP), and hand coordination (HC)—correctly classified 82% of the BACs ≥0.08% and 67% of the BACs <0.08%, for an overall percentage correct of 72%. Four individual tests also predicted BAC status: HGN, FTN, PP, and HC. Four tests in combination and individually discriminated BAC status, although the overall percentages of accuracy, sensitivity, and specificity of the tests were below what was typically reported in literature on the roadside SFSTs. With the proper refinements, the four tests may assist marine officers with assessments of alcohol-related impairment in recreational boaters.

The roadside sobriety tests were developed in the late 1970s and early 1980s in two studies by the Southern California Research Institute (*1, 2*). The first study examined the usefulness of six candidate tests in detecting blood alcohol concentrations (BACs) of at least 0.10% (*1*). In that study, 238 participants were semirandomly assigned to one of four BAC Groups: 0.00%, 0.05%, 0.10%, and 0.15%. Law enforcement officers administered six tests to the participants. The six tests were one-leg stand (OLS), finger to nose (FTN), walk and turn (WAT), finger count (FC), tracing, and horizontal gaze nystagmus (HGN). On the basis of the results, the authors recommended a reduced battery of tests, which included the OLS, WAT, and HGN.

Nystagmus is a complex phenomenon that can occur for a variety of reasons (*3*). Within the impaired driving context, however, HGN specifically refers to a lateral jerking of the eyeball affected by alcohol, certain nervous system depressants, inhalants, and phencyclidine. The HGN test consists of six clues, three for each eye: lack of smooth pursuit, maximum deviation, and angle of onset (*4*). Four of six possible clues indicate impairment. The WAT test requires a person to assume a heel-to-toe position on a designated line, arms at the sides, and to listen while instructions are given. The person is then required to make nine heel-to-toe steps along the line, turn around keeping one foot on the line, and return with another nine heel-to-toe steps. Two of eight possible clues indicate impairment. The OLS test requires a person to stand, heels together, feet at a slight angle, and arms at the sides. The person is then required to raise one leg forward approximately 6 in. off the ground. Two of four possible clues indicate impairment.

In the second study (*2*), 297 participants were administered enough alcohol to reach peak BACs of 0.00%, 0.05%, 0.11%, and 0.15%. A combination of HGN, WAT, and OLS correctly identified 81.2% of the participants. Since the development of the roadside sobriety tests, they have been routinely used by law enforcement officers throughout the United States to identify BACs at or above the legal limit. Three validation studies have confirmed their usefulness (*5–7*).

The standardized field sobriety tests used at roadside to detect impairment in drivers with BACs of at least 0.08% are not suitable for the marine environment because two of the three tests (OLS and WAT) must be administered on a firm, flat surface. Marine officers who use these tests must bring the suspected boater to shore and wait a period of time, usually 15 min, to get the suspect adapted to being on land. Tests that can be administered without having to bring the suspect to shore will save time, but because of the motion of the boat on the water those tests would have to be administered with the suspect in a seated position. Previous efforts examined a variety of seated tests on boats and found encouraging results (*8, 9*).

The objective of this project was to develop sobriety tests that can be administered in the seated position to assist water patrol officers in detecting impairment caused by BACs of ≥0.08%. As in the roadside tests, the seated tests must be easy to administer, so as to not overburden law enforcement officers, who must continually monitor the environment for their own safety and the safety of the boaters suspected of impairment. The tests must discriminate impaired performance without the knowledge of the individual suspect's baseline performance. Most importantly, the tests must be useful for an arrest or release decision. Unlike the roadside tests, however, the seated tests cannot make use of any measure of equilibrium.

This paper reports the laboratory phase of the project. As was done in the past for the development of the roadside tests (*1, 4*), the usefulness of six candidate tests in detecting impairment was first evaluated in a controlled environment. Participants were tested at

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0.00% BAC, at half the legal limit (0.04%), at the legal limit (0.08%), and at 1.5 times the legal limit (0.12%).

The data were analyzed in five successive steps. First, researchers confirmed that the participants were tested at the intended target BACs. Second, researchers examined whether the total tests scores varied as a function of the four BAC groups. Third, researchers divided the BACs into groups and created a variable BAC status (BAC < 0.08% or BAC ≥ 0.08%) and examined whether the total tests scores varied as a function of it. Fourth, the correlations between BAC, BAC group, BAC status, and the six tests were examined. Finally, researchers conducted logistic regressions to establish whether the tests reliably predicted BAC status, individually and in combination.

METHOD

Participants

One hundred and fifty-seven men and women participated as paid volunteers. In addition, 17 scheduled participants failed to appear for testing, eight were dismissed for illegal drug use, and 13 were dismissed before testing because of evidence of health problems. The participants' ages ranged from 21 to 62 years (mean = 32.96, standard deviation = 10.70). Participants were 50.3% male and 49.7% female. They were 47.8% White, 20.4% African American, 3.2% Asian, 1.3% Pacific Islander, 0.6% American Indian, and 26.7% of other or unknown race. Twenty-eight percent of the participants were Latino. The participants' number of school years completed ranged from 1 to 24 (mean = 13.58, standard deviation = 3.63). Payment for participation was $100.

Testers

Twenty-four law enforcement officers participated in the study. Officers had an average of 9.7 years of experience administering the roadside SFSTs. Officers' participation spanned 4 days. Day 1 consisted of a training session on the tests' administration and scoring. Days 2, 3, and 4 were data collection days. Each data collection day lasted approximately 5 h. Officers were paid $100 per day.

Apparatus

The Intox EC/IR and the Alco Sensor FST (Intoximeters, Inc., St. Louis, Mo.) breath alcohol testing instruments were used to measure the participants' BAC.

Drug Screeners

All participants provided a urine specimen and were tested for drug use. Ten types of drugs were screened: methamphetamine, opiates, cocaine, marijuana, phencyclidene, benzodiazepines, barbiturates, methadone, tricyclic antidepressants, and amphetamine.

Pregnancy Tests

Female participants provided a urine specimen and the specimens were screened for human chorionic gonadotropin, the pregnancy hormone.

Tests

Six tests were evaluated:

- FTN. The FTN test required the participants to bring the tip of the index finger to touch the tip of the nose. It was performed with the eyes closed and the head tilted slightly back.
- Time estimation (TE). The TE test required the participants to estimate the passage of 30 s. It was performed with the eyes closed and the head tilted back. The test was scored as the absolute time deviation from 30 s.
- FC. The FC test required the participants to extend one hand forward palm up and to count to four while touching the tips of each finger with the tip of the thumb. The process was then reversed, and the participants counted backward. Three complete sets were performed.
- Hand coordination (HC). The HC test required the participants to perform a series of tasks with their hands. It was loosely adapted from the WAT test administered at roadside.
- Palm pat (PP). The PP test required the participants to extend one hand, palm up, and to place the other hand on it palm down. The participant was instructed to use the top hand to pat the bottom hand. The top hand rotated 180°, thereby alternating the pat between the back and the palm of the hand. The bottom hand remained stationary. The participant counted each pat aloud.
- HGN. Each eye was examined for lack of smooth pursuit, angle of onset, and jerking at maximum deviation.

Procedures

Participants were recruited with newspaper ads, Internet postings, flyers, and referrals. An initial telephone interview determined eligibility for the study. Applicants were screened in terms of health history, current health status, and use of alcohol and other drugs. The quantity-frequency–variability scale was used to classify applicants into five groups: abstainers, infrequent drinkers, light drinkers, moderate drinkers, and heavy drinkers (*10*). Only moderate and heavy drinkers were eligible to participate in the study. Pregnancy, chronic disease, or evidence of substance abuse resulted in exclusion from the study.

Participants were transported from their residence to the laboratory and from the laboratory to their residence by taxi or shuttle. Participants arrived at the facility in pairs at 9:00 a.m., 11:00 a.m., and noon. Thus, no more than six participants were tested per day.

On arrival at the laboratory, each participant gave informed consent to participate in the study, and each received a copy of the signed Informed Consent and of the Subjects' Bill of Rights. A breath alcohol test, a second administration of the Quantity-Frequency-Variability scale, a pregnancy test for women, and a drug screen confirmed eligibility for the study. Measurements of blood pressure, heart rate, height, and weight were taken next. Cardiovascular measures within acceptable ranges (systolic blood pressure = 120 ± 30 mmHg, diastolic blood pressure = 80 ± 20 mmHg, heart rate = 70 ± 20 beats/min) confirmed eligibility for the study.

Participants were randomly assigned to one of four groups (0.00% BAC, 0.04% BAC, 0.08% BAC, and 0.12% BAC) by lottery. No efforts were made to counterbalance moderate and heavy drinkers. Age, gender, weight, and height were used to calculate the alcohol dose. A drinking period of 30 min followed. Participants were served three equal-sized drinks at 10-min intervals and were instructed to pace

each drink evenly over the entire 10 min. Research staff monitored the participants continually throughout the drinking period.

For participants in the 0.04% BAC, 0.08% BAC, and 0.12% BAC groups, the alcohol drink consisted of 1 part 80 proof vodka and 1.5 part orange juice. For participants in the 0.00% BAC Group, the placebo drink consisted of 1 part water and 1.5 part orange juice. The placebo glasses had their rim swabbed with vodka and 10 mL of vodka floated in each of them to produce an initial taste and odor of alcohol.

Twenty minutes after the end of the third drink, BAC measurements were obtained at 5-min intervals until the peak BAC was detected. Peak BAC was expected 30 min after the end of the third drink. For the 0.00% BAC group, testing occurred at the first available testing window 30 min after drink. Participants were not privy to their target BAC.

When the participants reached the target BAC on the descending limb of their BAC curve, they were brought in the testing room and were asked to sit down. The battery of tests was administered twice to each participant, each time by a different tester, with only one tester in the testing room at a time. Only the results from the first battery were compiled. The second battery was for practice only, because participants' learning affected the test scores.

Testers remained in a separate room and had no interaction with the participants before testing them. A staff member was present during testing to ensure that the interaction between participant and tester was limited to the administration and scoring of the tests. A BAC reading was obtained immediately after the testing.

BAC and test order were counterbalanced. When the participants' BAC dropped below 0.03%, they were debriefed, paid $100, and transported home by taxi.

RESULTS

BACs

Of the 157 participants, 39 were assigned to the 0% BAC condition, 40 to the 0.04% BAC condition, 39 to the 0.08% BAC condition, and 39 to the 0.12% BAC condition (see Table 1). Unequal group sizes were the result of some participants' failure to meet study criteria. Moderate and heavy drinkers were equally divided among the four BAC groups.

In general, the testing BACs were slightly lower than the target BACs, for two reasons. First, the dosing procedure was aimed at avoiding overdosing the participants, for obvious health and safety reasons. Second, a bottleneck occasionally resulted when two participants reached the target BAC at the same time, which delayed some of the testing. The following analyses were conducted with the average of the pretest BACs and the posttest BACs.

Differences Across Four BAC Groups

The mean scores for the six tests across the four BAC groups increased with higher BACs. Mean scores increased with higher BACs. The mean score differences across BAC groups were statistically significant for FTN, HC, PP, and HGN (Table 1).

Differences Across BAC Status

In the field, marine officers need to assess whether boaters' BACs are ≥0.08%. Thus, it is important to examine whether the mean scores for the six tests differ significantly between two conditions, BAC < 0.08% or BAC ≥ 0.08%. To that end, a new variable was created by dividing the average BAC of the test battery into two categories: BACs < 0.08% and BACs ≥ 0.08%. Characteristics of the resulting variable (BAC status) are shown in Table 2. BAC status analyses were based on 138 of the 157 cases, because 19 participants had pretest and posttest BACs that were on both sides of the 0.08% cutoff. The mean scores for the six tests across BAC status are shown in Table 2. The mean scores across BAC status were consistent with the results across BAC Groups.

TABLE 1 BAC and Average Total Test Scores by BAC Group

	BAC Group				
Variable	1	2	3	4	*F*
BAC(%)					
Mean	0.000	0.038	0.079	0.110	1,527.37***
SD	0.000	0.009	0.004	0.012	
N	39	40	39	39	
FTN					
Mean	7.16	8.65	9.44	11.38	5.13**
SD	4.06	4.23	4.80	5.99	
N	38	40	39	39	
TE					
Mean	6.49	7.48	7.49	7.95	0.35
SD	5.30	8.61	5.14	6.29	
N	39	40	39	39	
FC					
Mean	4.74	6.90	7.46	7.90	2.19
SD	4.64	6.56	5.77	6.45	
N	39	40	39	39	
HC					
Mean	2.64	2.40	2.74	3.59	2.91*
SD	1.86	1.96	1.83	1.96	
N	39	40	39	39	
PP					
Mean	1.51	1.65	1.67	2.62	5.12**
SD	1.14	1.59	1.06	1.70	
N	39	40	39	39	
HGN					
Mean	2.03	3.60	4.85	5.28	23.53***
SD	2.02	2.23	1.74	1.43	
N	39	40	39	39	

NOTE: SD = standard deviation. BAC groups 1 to 4 had target BACs of 0.00%, 0.04%, 0.08%, and 0.12%, respectively, on the descending limb of the BAC curve. Lower scores indicate better performance.
* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$.

Correlations

TE and FC did not reliably correlate with BAC, BAC group, or BAC status. The correlations between HGN and BAC, BAC group, and BAC status were .56, .55, and .44, respectively (all with $p \leq .01$). The correlations between FTN and BAC, BAC group, and BAC status were .29, .30, and .25, respectively (all with $p \leq .01$). The correlations between PP and BAC, BAC group, and BAC status were .24, .26, and .26, respectively (all with $p \leq .01$). The correlations between HC and BAC, BAC group, and BAC status were .19, .18, and .19, respectively (all with $p \leq .05$).

TABLE 2 BAC and Average Total Tests Scores by BAC Status

Variable	BAC Status		*F*
	BAC < 0.080%	BAC ≥ 0.080%	
BAC(%)			
Mean	0.023	0.102	463.16***
SD	0.024	0.016	
N	85	53	
FTN			
Mean	8.11	10.77	9.37**
SD	4.29	5.87	
N	84	53	
TE			
Mean	6.91	7.91	0.75
SD	6.90	6.14	
N	85	53	
FC			
Mean	5.98	7.98	3.62
SD	5.73	6.45	
N	85	53	
HC			
Mean	2.54	3.28	4.89*
SD	1.89	1.96	
N	85	53	
PP			
Mean	1.64	2.42	9.49**
SD	1.36	1.57	
N	85	53	
HGN			
Mean	2.98	5.06	32.96***
SD	2.28	1.67	
N	85	53	

NOTE: Lower scores indicate better performance.
* $p \leq .05$, ** $p \leq .01$, ***$p \leq .001$.

BAC Status Classifications

The question of how the tests would predict BAC status was addressed next. Only the four tests that were found to have statistically significant differences across BAC status were included in these analyses. Note that because the prediction analyses build on the previous analyses, they may capitalize on chance. The following results, therefore, must be interpreted with caution.

Combined Tests

Logistic regression was used to predict BAC status with HGN positive or negative, FTN total score, PP total score, and HC total score as the predictors. A test of the full model with the four tests against a constant-only model was statistically significant, χ^2 (4, N = 137) = 33.89, $p < .001$. As shown in Table 3, the combination of the four tests correctly classified 82% of the BACs ≥ 0.08%, 67% of the BACs < 0.08%, for an overall percentage correct of 72.3%. Of the individual tests, however, only HGN positive or negative reliably predicted BAC status, χ^2 (1, N = 137) = 16.13, $p < .001$, indicating that FTN, PP, and HC did not improve the prediction beyond that of HGN.

Horizontal Gaze Nystagmus

A test of the full model with HGN positive or negative scores (negative = three or fewer clues, positive = four or fewer clues) against a constant-only model was statistically significant, χ^2 (1, N = 138) = 26.48, $p < .001$. As shown in Table 3, HGN alone correctly predicted BAC status in 67.4% of the cases.

Finger to Nose

The positive or negative criterion for FTN was set at nine clues based on analyses from pilot data not reported here. With that criterion, a test of the full model with FTN against a constant-only model was statistically significant, χ^2 (1, N = 137) = 4.38, $p < .05$. FTN alone correctly predicted BAC status in 59.9% of the cases.

Palm Pat

The positive or negative criterion for PP was set at two clues based on analyses from pilot data not reported here. With that criterion, a test of the full model with PP against a constant-only model was statistically significant, χ^2 (1, N = 138) = 4.23, $p < .05$. PP correctly predicted BAC status in 57.2% of the cases.

Hand Coordination

The positive or negative criterion for HC was set at three clues based on analyses from pilot data not reported here. With that criterion, a test of the full model with HC against a constant-only model was statistically significant, χ^2 (1, N = 138) = 3.87, $p < .05$. HC correctly predicted BAC status in 57.2% of the cases.

DISCUSSION OF RESULTS

The objective of this project was to develop sobriety tests for the marine environment. Six seated tests were evaluated in the laboratory to determine their feasibility for use on the water. Data were obtained

TABLE 3 Summary of Results from Tests

Test	Prevalence	% Correct	Sensitivity	Specificity	LR+	LR–
Combination	0.39	72.3	81.1	66.7	2.43	.28
HGN	0.38	67.4	86.8	55.3	1.94	.24
FTN	0.39	59.9	58.5	60.7	1.48	.68
PP	0.38	57.2	66.0	51.8	1.37	.66
HC	0.38	57.2	64.2	52.9	1.36	.68

NOTE: LR+ = positive likelihood ratio; LR– = negative likelihood ratio.

under double-blind conditions, at relatively low BACs. The six tests were administered by law enforcement officers with an average 9.7 years of experience administering the roadside SFSTs.

The combination of four tests, HGN, FTN, PP, and HC, correctly predicted BAC status in 72.3% of the cases. The positive likelihood ratio of 2.43 and the negative likelihood ratio of 0.28 indicate that the combined tests are useful in detecting alcohol-related impairment, but not conclusively.

The overall correct percentages, sensitivity, and specificity of the tests were below what is typically reported in the literature on the roadside SFSTs. Comparisons with prior studies, however, should be made with caution. First, in this study, the average BACs were considerably lower than in previous studies. In the Burns and Moskowitz study, for example, 48 participants were tested at a mean BAC of 0.120%, and 16 participants were tested at a mean BAC of 0.156% (*1*).

In comparison, in the current study, the highest BAC group was tested at a mean BAC of 0.110%. The wider distribution of BACs in the previous studies may have made the impairment or no impairment decision less difficult than in the current study. Second, the impairment or no impairment decisions were made exclusively on the basis of the tests, without external clues such as smell of alcohol, appearance, speech, and demeanor. Third, although the officers in the current study were required to have prior experience administering the roadside SFSTs, and were, therefore, assumed to have nearly equal proficiency in administering HGN, great differences in proficiency were in fact observed between the officers. Five of the 24 study officers had overall percentage correct for HGN of less than 50%. In addition, given that officers collected data for 3 days, with six participants scheduled per day, the maximum number of participants that could be examined by a single officer was 18, which may not have been enough to master the tests. In retrospect, it appears that the issue of officer proficiency was not given proper consideration in this study. Future studies should set up proficiency criteria for officers' participation, improved training, and asymptotic test performance before data collection.

Although the tests, as administered and scored by officers in the laboratory, had lower correct percentages, sensitivity, and specificity than is typically reported in the literature, they showed enough promise to warrant a field study. The field study, reported elsewhere, was conducted on the water by highly trained marine officers accompanied by civilian observers (*11*). The results indicated that the overall correct percentages, sensitivity, specificity, and reliability of the tests on the water were consistent with what is typically reported in the literature on roadside sobriety tests. Thus, the four tests may assist well-trained marine officers with assessments of alcohol-related impairment in boaters.

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Validation of sobriety tests for the marine environment

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ABSTRACT

The objective of this project was to develop sobriety tests that can be administered in the seated position to assist water patrol officers in detecting alcohol-related impairment in boaters. Four seated sobriety tests were administered to 330 boaters to determine the tests' usefulness in classifying boaters as having blood alcohol concentrations (BACs) below the illegal limit (BAC < .08%) or above the illegal limit (BAC ≥ .08%). Data were obtained by a team of four marine officers and two civilian observers on Lake of the Ozarks in central Missouri. The overall correct percentages, sensitivity, and specificity of the tests were consistent with what is typically reported in literature on the roadside sobriety tests. The tests' reliability was also consistent with what is typically reported in literature on the roadside sobriety tests. Thus, the four tests may assist marine officers with assessments of alcohol-related impairment in boaters.

1. Introduction

Over the past few decades, the number of recreational boaters has increased steadily (Tseng et al., 2009). There is evidence that alcohol consumption is elevated among recreational boaters (Khiabani et al., 2008; Logan et al., 1999) and that alcohol consumption significantly increases the risk of dying while boating (Driscoll et al., 2004; Lunetta et al., 1998; Smith et al., 2001). Some studies indicate that up to 70% of drowning victims test positive for alcohol (Browne et al., 2003; Driscoll et al., 2004).

The responsibility of detecting boating under the influence of alcohol (BUI) falls on water patrol officers. Their job, however, is fraught with difficulties. First, on some waterways, it is not illegal to drink while boating. An open container, therefore, is not probable cause for a stop. Second, on some waterways, there are no speed limits, making excessive speed not necessarily a clue of impairment. Third, environmental conditions (wind, water choppiness, and glare) can make it difficult to determine boaters' impairment. Finally, unlike land-based officers, water patrol officers do not have a validated battery of sobriety tests to be used on water.

To examine the type of tests water patrol officers currently use, a nationwide request was made to all agencies with water patrol duties to provide their BUI arrest records for the previous year. A total of 1146 BUI reports from agencies in Alaska, Arizona, Connecticut, Delaware, Florida, Georgia, Idaho, Illinois, Nevada, Ohio, Tennessee, Texas, Virginia, and Wisconsin were received and analyzed. With the exception of the three tests that constitute the standardized field sobriety tests (SFSTs), it was found that no test was uniformly administered from state to state or, often, from agency to agency within a state. This lack of standardization may result in uneven application of sanctions and penalties for BUI.

The SFSTs are not suitable for use on the water because walking and balance tests need to be administered on a firm, flat surface. Marine officers who use these tests must bring the suspected boater to shore and wait a pre-established period of time to get the suspect adapted to being on land (usually 15 min). This can be inconvenient for both officers and boaters. Tests that can be administered without bringing the suspect ashore will save time, but safety concerns mandate that they be performed with the suspect seated. Previous efforts examined a variety of seated tests on boats and found encouraging results (Sussman et al., 1990).

1.1. Prior research on sobriety tests

Two laboratory studies established the scientific basis of the roadside sobriety tests in the late 1970s and early 1980s. The first examined the usefulness of six candidate tests in detecting BACs of .10% and above (Burns and Moskowitz, 1977). In that study, 238 subjects were semi-randomly assigned to one of the four BAC groups: .00%, .05%, .10% and .15%. Note that the positive BAC groups represented half the legal limit, the legal limit, and 1.5 times the legal limit of the time. Law enforcement officers administered six tests to the subjects. The six tests were One-Leg Stand (OLS), Finger to Nose (FTN), Walk and Turn (WAT), Finger Count (FC), Tracing, and Horizontal Gaze Nystagmus (HGN). Based on the results, the authors recommended a reduced battery of tests which included the OLS, WAT, and HGN.

Nystagmus is an involuntary jerking of the eyeball that can occur for a variety of reasons (Dell'Osso, 1990), including pathology, trauma, vestibular disturbances, and other neural disorders. Within

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the impaired driving/boating context, however, HGN specifically refers to a lateral jerking of the eyeball affected by alcohol, certain nervous system depressants, inhalants, and dissociative anesthetics, including phencyclidine. The HGN test consists of six clues, three for each eye: lack of smooth pursuit, maximum deviation, and angle of onset (National Highway Traffic Safety Administration, 1999). Four out of six possible clues indicate impairment. The WAT test requires a person to assume a heel-to-toe position on a real or imaginary line, arms at the sides, and to listen while instructions are given. The person is then required to make nine heel-to-toe steps along the line, turn around keeping one foot on the line, and return with another nine heel-to-toe steps. Two out of eight possible clues indicate impairment. The OLS test requires a person to stand, feet together, and arms at the sides. The person is then required to raise one leg up about 6 in. off the ground (15 cm), foot parallel to the ground, toes pointed forward, and count aloud for 30 s. Two out of four possible clues indicate impairment. The WAT and OLS are commonly referred to as divided attention tests. In both tests, the person is asked to maintain equilibrium while receiving fairly complex instructions. It is the combination of physical and cognitive demands that make the tests sensitive to the effects of alcohol.

In the second study (Tharp et al., 1981), 297 subjects were administered enough alcohol to reach peak BACs of .00%, .05%, .11%, and .15%. Again, .05% was half the legal limit, .11% was slightly above the legal limit, and .15% was 1.5 times the legal limit at the time (.10%). A combination of HGN, WAT, and OLS correctly identified 81.2% of the subjects.

Since the development of the roadside sobriety tests, they have been routinely used by law enforcement officers throughout the US to identify BACs above the legal limit. Three validation studies have confirmed their usefulness. The first (Burns and Anderson, 1995), is unique because it was conducted in Colorado, which had a two-tiered system, one for drivers with BACs between .05% but less than .10% (now .08%), who were charged with driving-while-ability-impaired; and one tier for drivers with BACs of .10% and above (now .08%), who were charged with driving-under-the-influence. Thirty-one officers from six law enforcement agencies collected the data, accompanied on approximately half the stops by observers who verified that data were collected according to study procedures. In general, the officers stopped drivers suspected of being BAC .05% and above and administered the three sobriety tests (HGN, WAT, and OLS). The accuracy of the arrest/release decision was verified with a portable breath alcohol screener, which was always administered following the sobriety tests. Complete data were collected from 234 drivers, with BACs ranging from .00% to .34%, with an average BAC of .15%. With the .05% criterion, Colorado officers using the sobriety tests had an overall correct percentage of 85.9%, .89 sensitivity, and .76 specificity.

The second validation study was conducted in Florida (Burns and Dioquino, 1997), which already had a .08% statute. Eight officers from Pinellas County Sheriff's Office collected the data, at times accompanied by observers. In general, the procedures were similar to the Colorado study (Burns and Anderson, 1995). Complete data were collected from 256 drivers, with BACs ranging from .00% to .28%. Florida officers using the sobriety tests had an overall correct percentage of 93.0%, .96 sensitivity, and .82 specificity.

The third validation study was conducted in California (Stuster, 2006), which also had a .08% statute. Seven officers from the San Diego Police Department collected the data. In general, the procedures were similar to the Colorado and Florida studies (Burns and Anderson, 1995; Burns and Dioquino, 1997). Complete data were collected from 297 drivers, with an average BAC of .12%. California officers using the sobriety tests had an overall percent correct of 91.2%, .98 sensitivity, and .73 specificity.

Note that the prevalence of BAC $\geq$ .08% in the field studies is dramatically higher than the prevalence in the earlier laboratory studies. In the laboratory, the distribution of BACs is dictated by practical and ethical considerations. In the field, the range of BACs is much greater.

1.2. Current project

The objective of this project was to develop sobriety tests that can be administered in the seated position to assist water patrol officers in detecting impairment caused by BACs of .08% and above. As in the roadside tests, the seated tests must be easy to administer, so as to not overburden law enforcement officers, who must continually monitor the environment for their own safety and the safety of the boaters suspected of impairment. The tests must discriminate impaired performance without the knowledge of the individual suspect's baseline performance. Most importantly, the tests must be useful for an arrest/release decision. Unlike the roadside tests, however, the seated tests cannot make use of any measure of equilibrium.

In prior validation studies of the SFSTs, the general approach has been to have officers stop drivers suspected of driving under the influence of alcohol, administer three standardized sobriety tests, and make an arrest/release decision on the basis of the three tests. The accuracy of the arrest/release decision was verified with a portable breath alcohol screener, which was administered following the sobriety tests by trained civilian observers. This study followed the same approach. Marine officers stopped boaters suspected of BUI, asked them to come aboard the patrol vessel, and administered four sobriety tests. The four sobriety tests, described in detail elsewhere (Fiorentino et al., 2011), were horizontal gaze nystagmus (HGN), finger to nose (FTN), palm pat (PP), and hand coordination (HC). Lastly, an alcohol breath test was obtained to verify the accuracy of the tests in detecting BACs of .08% and above.

Unlike previous SFSTs validation studies, the alcohol breath tests were administered by the marine officers, not the civilian observers. This was required for practical and safety reasons due to the small size of the deck on the police vessel. The space limitation made it cumbersome for the marine officer and the observer to switch places in order for the observer to interact with the BUI suspect and administer the alcohol breath test. The switch would have created a potentially unsafe situation in which the officer could not guarantee the safety of the boater and the observer. The role of the observers, therefore, was limited to ensuring that the alcohol breath test consistently followed the four sobriety tests in the examination.

2. Method

2.1. Study site

The study was conducted on the Lake of the Ozarks in central Missouri. The Missouri State Water Patrol (MSWP) was the collaborating agency. MSWP is based in Jefferson City, but the study site was in Osage Beach.

The Lake of the Ozarks was selected as the study site for two reasons. The first was the cooperation of MSWP, which provided study officers. The second was that the lake is a popular boating destination, with enough cases of BUI to support data collection for the study.

2.2. Study officers

Four marine officers were selected by the MSWP for participation in the study. All four officers had prior experience administering the HGN test.

2.3. Officers' training

Officer training spanned four days, beginning Thursday, June 18, 2009. Day 1 consisted of an 8-h in-class explanation and demonstration of the four sobriety tests (HGN, FTN, PP, and HC). During that class, conducted by SCRI staff, the officers became familiar with the administration and scoring of the tests. Two volunteers drank until their BACs were over .08%. The four officers then practiced on the volunteers while the SCRI staff provided feedback. Days 2, 3, and 4 consisted of 10-h shifts, in patrol boats on the water, with the sole purpose of allowing the marine officers to become proficient with the tests.

2.4. Civilian observers

There were two observers for all study activities. They were based in Osage Beach for the duration of the study. For the observers' safety, the officer was always positioned between them and the suspect. The observers were close enough to observe the suspects' performance but far enough as to not interfere (about 5 ft away, or 1.5 m).

2.5. Sobriety tests

2.5.1. Horizontal gaze nystagmus

The HGN test requires three separate checks, administered independently to each eye. Four or more clues indicate impairment due to BAC $\geq$ .08%.

2.5.2. Finger to nose

The FTN test requires the subject to bring the tip of the index finger to touch the tip of the nose. It is performed with eyes closed and head tilted slightly back. Nine or more clues indicate impairment due to BAC $\geq$ .08%.

2.5.3. Palm pat

The PP test requires the subjects to place one hand extended, palm up, out in front of them. The other hand is placed on top of the first with the palm facing down. The top hand rotates 180° and pats the bottom hand, alternating between the back of the hand and the palm of the hand. The bottom hand remains stationary. The subjects count out loud in relation with each pat. Two or more clues indicate impairment due to BAC $\geq$ .08%.

2.5.4. Hand coordination

The HC test requires the subjects to perform a series of tasks with their hands. It is very loosely adapted from the Walk-And-Turn test performed on land. Three or more clues indicate impairment due to BAC $\geq$ .08%.

2.6. Equipment

Officers used a pen, pencil, or small flashlight as the stimulus for the HGN test. Four Alco Sensor FST (Intoximeter, Inc., St. Louis, MO) breath alcohol testing instruments were used as the alcohol screeners. The observers were required to meet the MSWP's water safety requirements while on the patrol boat.

2.7. Study dates and shifts

Data were collected from Friday, June 26, 2009 to Monday, September 7, 2009, inclusive. Data were collected during the expected busiest boating days: Fridays, Saturdays, Sundays, and holidays. Shifts started at 12 p.m. and lasted from 10 to 12 h, depending on the workload.

2.8. Procedures

The general procedures for the study were as follows. The officers stopped boaters suspected of BUI and asked them to come aboard the patrol boat. The suspects sat on a bench seat on the stern of the boat. After a few agency-specific questions, the officer administered the sobriety tests in the following order: HGN, FTN, PP, and HC. The tests were scored during administration (Fig. 1). Following the tests, two successive alcohol breath tests were administered. At this point, based on evidence from the sobriety tests and the breath alcohol tests, the officer either released or arrested the boater. The observers ensured that the sobriety tests' data were collected prior to the alcohol breath tests.

In case the BUI suspect was released, the officer and the observer resumed patrolling the assigned area. In case of an arrest, the suspect was brought ashore and processed for arrest by the officer. Because that took some time, the observer often teamed up with another available study officer.

Of the 331 study cases, 251 (76%) were obtained with observers present and 80 (24%) were obtained without observers. When possible, given the limitations of operating in a small space on the patrol boat, the observers also scored some of the sobriety tests while the officers were administering them. Only a portion of the FTN, PP, and HC tests could be scored by the observers. No HGN test could be scored by the observers because it was impossible to clearly see the suspects' eyes from their position on the boat. The observers and the officers never shared their results prior to the administration of the alcohol breath tests.

3. Results

3.1. Stop characteristics

With observers, data collection hours ranged from 1:59 pm to 6:04 am. Without observers, data collection hours ranged from 10:20 am to 7:04 am.

There were two types of stops in the study. A probable cause stop involved a boater suspected of BUI by the officer. A checkpoint stop involved a boater selected at random from the flow of boats. With observers, 221 (88%) of the stops were probable cause and 30 (12%) of the stops were checkpoint. Without observers, 41 (51.3%) of the stops were probable cause, 14 (17.5%) were checkpoint, and 25 (31.3%) were unknown.

Stops were conducted under clear, cloudy, and rainy conditions; with winds ranging from zero to 16+ mph; with air temperature ranging from the 60 s to the 100 s; with water temperature ranging from the 70 s to the 90 s; on calm, choppy, or rough waters; and with daylight, dusk, and dark lighting conditions.

3.2. Sample characteristics

Occasionally, it was necessary to release control of a boat to a suitable passenger. Some passengers, therefore, were administered the tests to determine their level of impairment. Although the passengers were not tested for the purpose of an arrest/release decision, their data were included in the analyses.

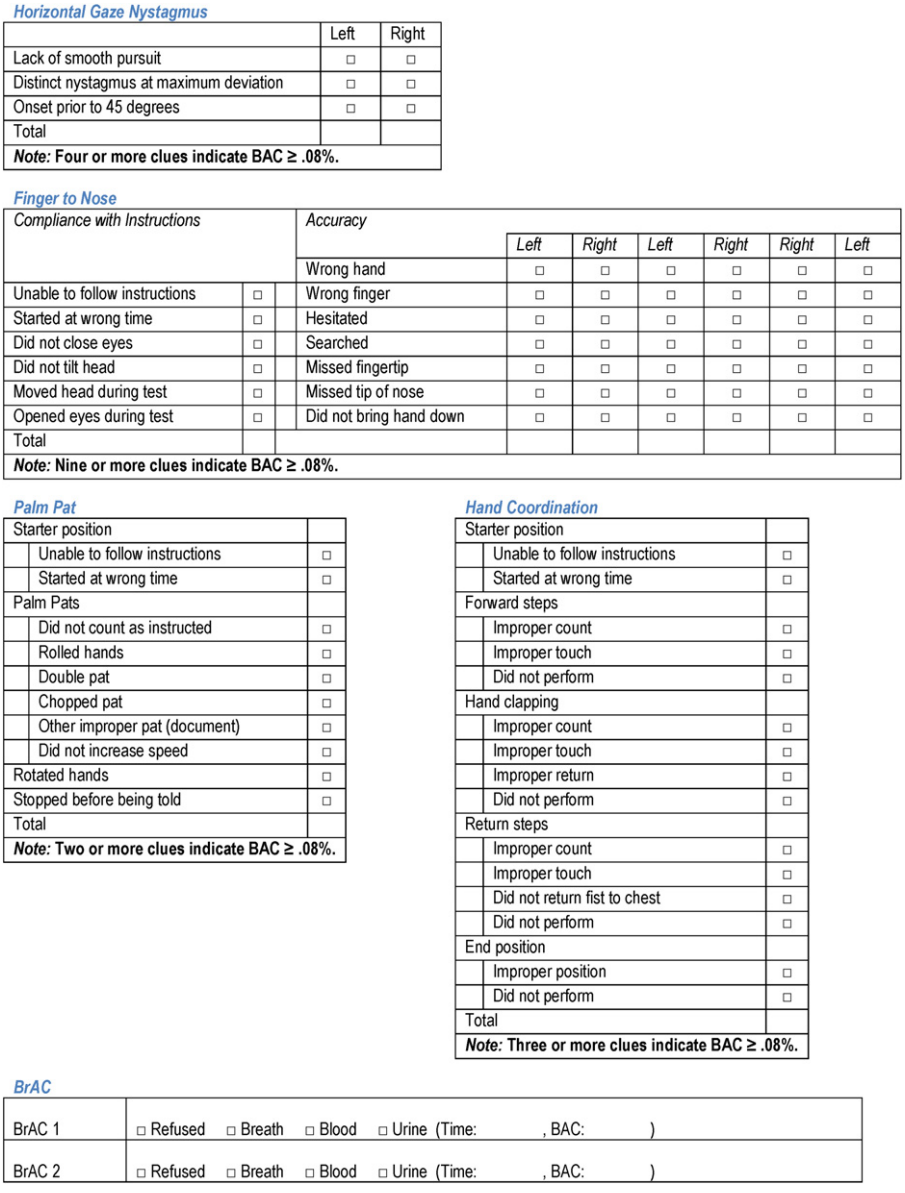
Boaters on jet skis, pontoons, cruisers, and other vessels were stopped. Stopped boaters tended to be white males between the ages of 18 and 80.

3.3. Blood alcohol concentrations

BACs ranged from .00% to .32% (N = 330, M = .072, SD = .061, Median = .060).

Table 1
BAC and HGN, FTN, PP, HC total clues by BAC status and observer status.

Variable		With observers		Without observers		Combined	
		BAC < .08%	BAC ≥ .08%	BAC < .08%	BAC ≥ .08%	BAC < .08%	BAC ≥ .08%
BAC	Mean	.028	.134	.028	.125	.028	.133
	SD	.025	.040	.025	.041	.028	.041
	N	141	109	49	31	190	140
HGN	Mean	1.45	4.98	1.94	4.97	1.58	4.98
	SD	1.57	1.53	1.68	1.54	1.61	1.52
	N	141	109	48	31	189	140
FTN	Mean	5.72	8.17	6.29	8.59	5.86	8.26
	SD	3.34	3.72	3.42	5.00	3.36	4.02
	N	141	109	49	31	190	140
PP	Mean	1.30	2.34	1.41	2.35	1.33	2.34
	SD	.93	1.18	1.02	1.28	.95	1.20
	N	141	109	49	31	190	140
HC	Mean	2.34	3.00	2.29	2.52	2.33	2.89
	SD	1.49	1.42	1.62	1.21	1.52	1.39
	N	141	109	49	31	190	140



Horizontal Gaze Nystagmus

	Left	Right
Lack of smooth pursuit	□	□
Distinct nystagmus at maximum deviation	□	□
Onset prior to 45 degrees	□	□
Total		
***Note:* Four or more clues indicate BAC ≥ .08%.**		

Finger to Nose

Compliance with Instructions			*Accuracy*	*Left*	*Right*	*Left*	*Right*	*Right*	*Left*
			Wrong hand	□	□	□	□	□	□
Unable to follow instructions	□		Wrong finger	□	□	□	□	□	□
Started at wrong time	□		Hesitated	□	□	□	□	□	□
Did not close eyes	□		Searched	□	□	□	□	□	□
Did not tilt head	□		Missed fingertip	□	□	□	□	□	□
Moved head during test	□		Missed tip of nose	□	□	□	□	□	□
Opened eyes during test	□		Did not bring hand down	□	□	□	□	□	□
Total									
***Note:* Nine or more clues indicate BAC ≥ .08%.**									

Palm Pat

Starter position	
Unable to follow instructions	□
Started at wrong time	□
Palm Pats	
Did not count as instructed	□
Rolled hands	□
Double pat	□
Chopped pat	□
Other improper pat (document)	□
Did not increase speed	□
Rotated hands	□
Stopped before being told	□
Total	
***Note:* Two or more clues indicate BAC ≥ .08%.**	

Hand Coordination

Starter position	
Unable to follow instructions	□
Started at wrong time	□
Forward steps	
Improper count	□
Improper touch	□
Did not perform	□
Hand clapping	
Improper count	□
Improper touch	□
Improper return	□
Did not perform	□
Return steps	
Improper count	□
Improper touch	□
Did not return fist to chest	□
Did not perform	□
End position	
Improper position	□
Did not perform	□
Total	
***Note:* Three or more clues indicate BAC ≥ .08%.**	

BrAC

BrAC 1	□ Refused □ Breath □ Blood □ Urine (Time: , BAC:)
BrAC 2	□ Refused □ Breath □ Blood □ Urine (Time: , BAC:)

Fig. 1. Officers' data collection form.

3.4. BACs and tests' differences by BAC status

The tests were examined by BAC Status (BACs < .08% v. BAC ≥ .08%). Note that this is a very conservative approach as it classifies cases on the basis of the criterion rather than the behavioral characteristics of the subject. One of the 251 cases from the observer data was missing a BAC, as the boater refused to provide a breath or blood specimen. That case was dropped from the analyses. One case from the without observer data was missing the HGN test. That case was included in the analyses.

Analysis of variance (ANOVA) was conducted on each of the variables to determine whether BAC, HGN, FTN, PP, and HC varied as a function of BAC Status. Table 1 reports the means, standard deviation and number of cases for each of those variables by BAC Status and observer status. Because there were only minor differences between the data set obtained with observers and the data set obtained without observers, only the ANOVAs for the combined data set are reported here.

As expected, the differences between lower BACs ($M = .028\%$) and higher BACs ($M = .133\%$) were statistically significant, $F(1, 328) = 837.36$, $p < .001$. There were statistically significant differences in total scores as a function of BAC Status for all four tests: HGN, $F(1, 327) = 377.10$, $p < .001$; FTN, $F(1, 328) = 34.76$, $p < .001$; PP, $F(1, 328) = 73.15$, $p < .001$; and HC, $F(1, 328) = 12.03$, $p < .01$.

3.5. Correlations between BAC, BAC status, HGN, FTN, PP, and HC

The correlations between the four tests, BAC, and BAC Status are shown in Table 2. The test with the highest correlation to BAC was HGN, followed by PP, FTN, and HC. There was no statistically significant difference in the HGN-BAC correlation between data collected with observers and data collected without observers, $z = -.65$, $p = .51$. There was no statistically significant difference in the FTN-BAC correlation between data collected with observers and data collected without observers, $z = .56$, $p = .58$. There was no statistically significant difference in the PP-BAC correlation between data collected with observers and data collected without observers, $z = .47$, $p = .64$. There was no statistically significant difference in the HC-BAC correlation between data collected with observers and data collected without observers, $z = 1.27$, $p = .20$.

3.6. Positive/negative classifications

Because there were no statistically significant differences between the data collected with observers and the data collected without observers in the correlations between BAC and each of the four tests, it was possible to conduct the classification analyses on the combined data set. Table 3 summarizes the classification analyses.

3.6.1. Horizontal gaze nystagmus

A test of the full model with HGN Positive/Negative scores against a constant-only model was statistically significant, χ^2 (1, $N = 329$) = 174.31, $p < .001$. HGN alone correctly predicted BAC Status in 85% of the cases. Sensitivity was .86 and specificity was .84. The positive predictive value was .80 and the negative predictive value was .89. Positive likelihood ratio and negative likelihood ratio were 5.27 and .16, respectively.

3.6.2. Finger to nose

A test of the full model with FTN Positive/Negative scores against a constant-only model was statistically significant, χ^2 (1, $N = 330$) = 32.85, $p < .001$. FTN alone correctly predicted BAC Status in 67% of the cases. Sensitivity was .49 and specificity was .81. The positive predictive value was .65 and the negative predictive value was .68. Positive likelihood ratio and negative likelihood ratio were 2.56 and .63, respectively.

3.6.3. Palm pat

A test of the full model with PP Positive/Negative scores against a constant-only model was statistically significant, χ^2 (1, $N = 330$) = 37.74, $p < .001$. PP alone correctly predicted BAC Status in 65% of the cases. Sensitivity was .76 and specificity was .57. The positive predictive value was .57 and the negative predictive value was .77. Positive likelihood ratio and negative likelihood ratio were 1.77 and .41, respectively.

3.6.4. Hand coordination

A test of the full model with HC Positive/Negative scores against a constant-only model was statistically significant, χ^2 (1, $N = 330$) = 12.37, $p < .001$. HC alone correctly predicted BAC Status in 59% of the cases. Sensitivity was .62 and specificity was .57. The positive predictive value was .52 and the negative predictive value was .67. Positive likelihood ratio and negative likelihood ratio were 1.46 and .66, respectively.

3.6.5. Combined tests

HGN and FTN were the best combination of two tests. Combined, they correctly predicted BAC Status in 75% of the cases, χ^2 (1, $N = 329$) = 86.44, $p < .001$. Sensitivity was .46 and specificity was .96. The positive predictive value was .89 and the negative predictive value was .70. Positive likelihood ratio and negative likelihood ratio were 10.80 and .57, respectively.

HGN, FTN, and PP were the best combination of three tests. That combination correctly predicted BAC Status in 72% of the cases, χ^2 (1, $N = 329$) = 72.62, $p < .001$. Sensitivity was .39 and specificity was .97. The positive predictive value was .90 and the negative predictive value was .68. Positive likelihood ratio and negative likelihood ratio were 12.15 and .63, respectively.

The four tests combined correctly predicted BAC Status in 68% of the cases, χ^2 (1, $N = 329$) = 50.71, $p < .001$. Sensitivity was .28 and specificity was .98. The positive predictive value was .91 and the negative predictive value was .65. Positive likelihood ratio and negative likelihood ratio were 13.16 and .74, respectively.

HGN and any one of the FTN, PP, and HC correctly predicted BAC Status in 85% of the cases, χ^2 (1, $N = 329$) = 165.67, $^{\mathrm{P}} < .001$. Sensitivity was .81 and specificity was .87. The positive predictive value was .82 and the negative predictive value was .86. Positive likelihood ratio and negative likelihood ratio were 6.36 and .22, respectively.

Without HGN, the best predictor of BAC Status was the combination of FTN, PP and HC, which correctly predicted 66% of the cases, χ^2 (1, $N = 330$) = 29.99, $p < .001$. Sensitivity was .29 and specificity was .93. The positive predictive value was .76 and the negative predictive value was .64. Positive likelihood ratio and negative likelihood ratio were 4.28 and .76, respectively.

Table 2
Correlations between BAC, BAC status and HGN, FTN, PP and HC by observer status.

Variable	With observers		Without observers		Combined	
	BAC	BAC status	BAC	BAC status	BAC	BAC status
HGN	.757**	.750**	.791**	.581**	.761**	.715**
FTN	.396**	.324**	.333**	.228	.375**	.298**
PP	.471**	.428**	.422**	.299*	.458**	.403**
HC	.297**	.207**	.139	.030	.265**	.182**

* $p \leq .05$.
** $p \leq .01$.

Table 3
Prediction of BAC status by four tests alone and in combination.

Test	Prevalence	% correct	Sensitivity	Specificity	PPV	NPV	LR+	LR−
1. HGN positive/negative	.43	84.8	.86	.84	.80	.89	5.27	.16
2. FTN positive/negative	.42	67.3	.49	.81	.65	.68	2.56	.63
3. PP positive/negative	.42	65.2	.76	.57	.57	.77	1.77	.41
4. HC positive/negative	.42	59.4	.62	.57	.52	.67	1.46	.66
1, 2	.43	74.5	.46	.96	.89	.70	10.80	.57
1,3	.43	81.5	.70	.90	.84	.80	6.96	.33
1, 4	.43	76.0	.56	.90	.81	.74	5.93	.48
2, 3	.42	68.5	.41	.89	.73	.67	3.68	.67
2, 4	.42	65.8	.34	.89	.70	.65	3.19	.74
3, 4	.42	66.1	.51	.77	.62	.68	2.22	.63
1, 2, 3	.43	72.0	.39	.97	.90	.68	12.15	.63
1, 2, 4	.43	69.0	.31	.97	.88	.66	9.95	.71
1, 3, 4	.43	74.5	.49	.93	.84	.71	7.17	.54
2, 3, 4	.42	66.1	.29	.93	.76	.64	4.28	.76
1, 2, 3, 4	.43	68.1	.28	.98	.91	.65	13.24	.74
1 and any other one test	.43	84.5	.81	.87	.82	.86	6.39	.22
1 and any other two tests	.43	79.3	.64	.91	.84	.77	7.10	.40
2 and any other one test	.43	69.7	.49	.85	.71	.69	3.30	.60
2 and any other two tests	.43	70.8	.44	.91	.78	.69	4.84	.62
3 and any other one test	.43	71.3	.73	.70	.65	.78	2.46	.39
3 and any other two tests	.43	76.3	.61	.87	.78	.75	4.84	.44
4 and any other one test	.43	66.3	.59	.71	.61	.70	2.08	.57
4 and any other two tests	.43	73.3	.54	.87	.76	.72	4.28	.52

Note. PPV = positive predictive value. NPV = negative predictive value. LR+ = positive likelihood ratio. LR− = negative likelihood ratio. HGN = horizontal gaze nystagmus, FTN = finger to nose. PP = palm pat. HC = hand coordination.

3.7. Reliability

When possible, the observers scored the FTN, PP, and HC tests while the officer administered the tests to the BUI suspects. HGN could not be scored because the eyes of the BUI suspects were not clearly visible from where the observers were standing on the patrol boat.

For FTN, the correlation between the total score of the officer and the total score of the observer was .84. Kappa was .73 ($N = 134$), indicating substantial agreement. For PP, the correlation between the total score of the officer and the total score of the observer was .84. Kappa was .87 ($N = 134$), indicating almost perfect agreement. For HC, the correlation between the total score of the officer and the total score of the observer was .82. Kappa was .84 ($N = 133$), indicating almost perfect agreement.

4. Discussion

The current project is the first to systematically examine the usefulness of four seated sobriety tests for use in the marine environment. Data were obtained by a team of four marine officers and two civilian observers.

Officers were extensively trained in administering the four tests. Only when the officers were proficient and comfortable administering and scoring the test did data collection begin.

The tests were administered at almost all hours of the day; with probable cause or at sobriety checkpoints; under clear or cloudy weather; with and without wind; at various water and air temperatures; on calm, choppy, or rough water surface; and under various lighting conditions.

The sample of boaters was relatively homogeneous, as it consisted predominantly of Caucasian males. Very few women, Latinos, African Americans, and Asians were stopped for the study. Ages ranged from 18 to 80 years.

Study BACs ranged from .00% to .32%. HGN was found to be the most useful test in predicting BACs of .08% and above, followed by FTN, PP, and HC. A positive HGN test indicates a .80 probability that the BUI suspect has a BAC $\geq$ .08%. Thus, HGN is a very good predictor of BAC Status not only at roadside, but also on the water. Alone, it can correctly identify 85% of BUI suspects as either BAC < .08% or BAC $\geq$ .08%. Officers who can properly administer it and score it may confidently rely on it to form their arrest/release decision.

FTN is a moderate predictor of BAC Status. Alone, it can correctly identify 67% of BUI suspects as either BAC < .08% or BAC $\geq$ .08%. A positive FTN test indicates a .65 probability that the BUI suspect has a BAC $\geq$ .08%.

The PP and HC tests are only fair predictors of BAC Status. Alone, they can correctly identify 65% and 59%, respectively, of BUI suspects as either BAC < .08% or BAC $\geq$ .08%. A positive PP test indicates a .57 probability that the BUI suspect has a BAC $\geq$ .08%. A positive HC test indicates a .52 probability that the BUI suspect has a BAC $\geq$ .08%.

HGN and any one of the FTN, PP, and HC correctly predicted BAC Status in 85% of the cases. The positive likelihood ratio of 6.36 and the negative likelihood ratio of .22 indicate that this combination is useful in detecting alcohol-related impairment.

Without HGN, the best predictor of BAC Status was the combination of FTN, PP, and HC, which correctly predicted 66% of the cases. The positive likelihood ratio of 4.28 and the negative likelihood ratio of .76 indicate that this combination is likely to be moderately useful in detecting alcohol-related impairment.

The overall correct percentages, sensitivity, and specificity of the tests were consistent with what is typically reported in literature on the roadside SFSTs. It should be noted that the prevalence of BACs at or above .08% was lower in the current field study (.43) than in the previous field studies on SFSTs (.79, .80, .73).

The tests' reliability was also consistent with what is typically reported in literature on the roadside SFSTs. Note, however, that HGN could not be included in the reliability analyses because it was impossible for the observers to clearly see the suspects' eyes from their position on the boat.

It is proposed that marine officers administer HGN, FTN, PP, and HC to all BUI suspects, and then, for each suspect, use the pattern of test results to estimate the probability of BAC $\geq$ .08% as shown in Table 3. The usefulness of this approach should be assessed periodically, including a systematic review of the performance of each test, alone and in combination. If necessary, changes in administration and scoring may be required from time to time to maximize the predictive power of the battery.

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Appendix A. Tests' scoring sheet and instructions

A.1. General instructions

To ensure that the subjects are stable, give the following instructions to all subjects before starting any of the tests.

- Please sit straight at the front edge of your seat.
- Put your arms down at your sides.
- Place your feet shoulder-width so that you are comfortable and stable.
- Are you comfortable and stable?
- Wait for response.
- Do not move your feet until the test is over. Stay in this position. Do not do anything else until I tell you to do so. Do you understand?
- Get acknowledgement of understanding.

A.2. Finger to nose

This test requires the subjects to bring the tip of the index finger to touch the tip of the nose. It is performed with eyes closed and head tilted slightly back. This test should be administered in an environment where the subject is stable and is able to tilt their head back with eyes closed without risking personal injury.

A.2.1. Administrative procedures

- Tell the subjects to make a fist with both hands, extend the index fingers, and turn the palms forward.
- Tell the subjects that when you say BEGIN, they should tilt their head back slightly and close their eyes.
- Demonstrate how head should be tilted back, but do not close your eyes.
- Inform the subjects that you will instruct them to bring the tip of the index finger to touch the tip of the nose.
- The arm is brought directly from the subjects' side in front of the body touching the tip of the nose with the tip of the index finger.
- Demonstrate how the subject is supposed to move the arm and how they are supposed to touch the tip of the nose with the tip of the finger.
- Tell the subjects that as soon as they touch their nose, they must return the arm to their side.
- Tell the subjects that when you say RIGHT they must move the right hand index finger to their nose; and when you say LEFT they must move the left hand finger to their nose.
- Get acknowledgement of understanding.
- Tell the subjects to BEGIN.
- Ensure they tilt their head back and close their eyes. Do not start to give the commands until the subjects are in compliance. If necessary, emphasize to the subjects that they must keep their eyes closed until you say to open them.
- Give the commands in exactly this order: LEFT, RIGHT, LEFT, RIGHT, RIGHT, LEFT.
- Make sure the subjects return the arms to their side immediately after each attempt. Pause about 2 or 3 s between commands.
- After the sixth attempt, tell the subjects to open their eyes and straighten their head.

A.2.2. Documenting the test

The test requires monitoring two sets of clues: compliance with instructions and finger-to-nose accuracy.

A.2.3. Criterion

Nine or more clues suggest that the individual being tested is impaired with BAC $\geq$ .08%.

A.3. Hand coordination

This test requires the subjects to perform a series of tasks with their hands. It is adapted from the Walk-And-Turn test performed on land.

A.3.1. Administrative procedures

- Tell the subjects to make fists with both hands, place the left fist thumb against the sternum, and the thumb side of the right fist against the fleshy side of the left fist.
- Demonstrate.
- Tell the subjects to stay in that position.
- Tell the subjects that when you say BEGIN they must perform four tasks. The first is to count aloud from one to four, placing one fist in front of the other, in step-like fashion, making sure the thumb side of one fist is touching the fleshy side of the other fist at each step.
- Demonstrate.
- The second task is to memorize the position of the fists after having counted to four, clap the hands three times (no aloud count required), and return the fists in the memorized position.
- Demonstrate.
- The third task is to move the fists in step-like fashion in reverse order counting aloud from five to eight, and return the left fist to the chest.
- Demonstrate.
- Finally, tell the subjects to return their hands, opened and palms down, to their laps.
- Get acknowledgement of understanding.
- Say BEGIN.

A.3.2. Documenting the test

The test requires monitoring for compliance with instructions.

A.3.3. Criterion

Three or more clues suggest that the individual being tested is impaired with BAC $\geq$ .08%.

A.4. Palm pat

The Hand Pat FST requires the subjects to place one hand extended, palm up, out in front of them. The other hand is placed on top of the first with the palm facing down. The top hand rotates 180° and pats the bottom hand, alternating between the back of the hand and the palm of the hand. The bottom hand remains stationary. The subject counts out loud, ONE-TWO, ONE-TWO, etc., in relation with each pat.

A.4.1. Administrative procedures

- Start by instructing the subjects to put one hand out in front of them with the open palm facing upward. The opposite hand is

then placed on top of the first hand with the open palm facing downward.
- The hand with the palm facing upward is held in a stationary position. The hand on top with the palm facing downward will be the only hand moving.
- When told to begin, the subjects will rotate the top hand 180° and pat the back of the top hand to the palm of the bottom hand simultaneously counting out loud, "one". The top hand then rotates 180° so the palm of the top hand pats the palm of the bottom hand simultaneously counting out loud, "Two".
- Demonstrate.
- The process then repeats. The subjects should start at a slow speed, then gradually increase the speed until a relatively rapid pace is reached.
- If necessary, prompt the subject to increase the speed.
- The subject should perform this test for a minimum of 10 s but no more than 15 s.

A.4.2. Documenting the test

The test requires monitoring of compliance with instructions.

A.4.3. Criterion

Two or more clues suggest that the individual being tested is impaired with BAC ≥ .08%.

A.5. Horizontal gaze nystagmus

This test is made out of three separate checks, administered independently to each eye.

A.5.1. Administrative procedures
- Ask if the subject is wearing contact lenses and note the response. If the subject is wearing eyeglasses, have them removed.
  - "I am going to check your eyes."
  - "Keep your head still and follow this stimulus with your eyes only."
  - "Keep following the stimulus with your eyes until I tell you to stop."
  - "Do you understand?"
- Position the stimulus approximately 12–15 in. from the nose and slightly above eye level.
- Check to see that both pupils are equal in size and for the presence of resting nystagmus.
- Check the subject's eyes for the ability to track together.
  - Move the stimulus smoothly across the subject's entire field of vision. Check to see if the eyes track the stimulus together or one lags behind the other. If the eyes don't track together, it could indicate possible medical disorder, injury, or blindness.
- Check both eyes for lack of smooth pursuit.
  - Check the subject's left eye by moving the stimulus to the right. Move the stimulus smoothly, at a speed that requires approximately 2 s to bring the subject's eye as far to the side as it can go. Look at the subject's eye and determine whether it is able to pursue smoothly.
  - Move the stimulus all the way to the left, back across subject's face checking if the right eye pursues smoothly. Movement of the stimulus should take approximately 2 s out and 2 s back for each eye. Repeat the procedure.
- Check the eyes for distinct and sustained nystagmus at maximum deviation.
  - Move the stimulus to the subject's left side until the eye has moved as far to the side as possible. No white will be showing in the corner of the eye at maximum deviation.
  - Hold the eye at that position for a minimum of 4 s, then move the stimulus all the way across the subject's face to check the right eye, holding that position for a minimum of 4 s. Repeat the procedure.
- Check for onset of nystagmus prior to 45°.
  - Start moving the stimulus towards the right at a speed that would take approximately 4 s for the stimulus to reach the edge of the subject's shoulder. Watch the eye carefully for any sign of jerking. When observed, stop and verify that the jerking continues.
  - Move the stimulus to the left at a speed that would take approximately 4 s for the stimulus to reach the edge of the subject's shoulder. Again, when you see jerking, stop and verify that the jerking continues.
  - Repeat the procedure. If the subject's eyes start jerking before 45°, check to see that some white of the eye is still showing in the corner of the eye closest to the ear.
- Check for vertical nystagmus
  - Raise the stimulus upward until the subject's eyes are elevated as far as possible.
  - Hold for approximately 4 s and watch for evidence of jerking.

A.5.2. Documenting the test

The test requires monitoring of three sets of clues: lack of smooth pursuit for left and right eye, maximum deviation for left and right eye, and angle of onset for left and right eye.

A.5.3. Criterion

Four or more clues suggest that the individual being tested is impaired with BAC ≥ .08%.

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