



# ACCIDENT REPORT

VERY SERIOUS MARINE CASUALTY

REPORT NO 2/2024

APRIL 2024

## Loss of control of the powerboat *Awesome* near Little Thatch Island, British Virgin Islands on 2 October 2022, resulting in two fatalities

### SUMMARY

On the early evening of 2 October 2022, the mono-hulled offshore powerboat *Awesome* was returning to its home port when it unexpectedly veered to starboard, then rolled violently to port, ejecting ten occupants. *Awesome* ended up in a vertical position, with its bow in the air, briefly staying afloat before it started to sink by the stern. Two of the occupants did not survive the accident.

Three local boats were quickly on scene, and ten of the eleven occupants were located and taken to the shore. Five-year-old Brianna Graham was rushed to hospital, where she was declared deceased shortly afterwards. Despite an extensive and coordinated search effort, the eleventh occupant, 32-year-old Kristal Black, remained missing. Divers later found her body in the forward cabin of *Awesome* during a pre-salvage inspection of the wreck on the seabed.

The investigation concluded that the loss of control of *Awesome* was the result of a sudden mechanical failure. It was determined that the deceased were likely to have been rendered unconscious during the accident and subsequently drowned. No recommendations have been made in this report.

### NARRATIVE

At approximately 1200 on 2 October 2022, three powerboats (known locally as 'go-fast' boats) comprising *Awesome*, *Blessings* and an unnamed silver-coloured midnight express were trailer-launched from a dock at East End, Tortola, British Virgin Islands (BVI) (**Figure 1**). The group's intended destination was Sandbox beach, Prickly Pear Island, where the owner of *Awesome* was planning to spend the afternoon celebrating their son's ninth birthday with approximately thirty family and friends.

Once all three boats had been successfully launched, the captains started the engines to warm them up. One of *Blessings*' engines overheated so its captain decided to recover the boat back onto its trailer and replace it with *Shalom*, which was then brought to the dock. Meanwhile, *Awesome*'s captain (the owner) headed to the nearby island of Virgin Gorda to collect three family members. By 1430, *Awesome* had returned and all three boats were ready to depart for Prickly Pear Island.

The overheating issue with *Blessings* and subsequent transportation, launching and preparation of *Shalom* had delayed the group's departure. As the activities at Sandbox beach were only available until about 1500, the three captains decided to modify their plan and go instead to White Bay (**Figure 1**) on the neighbouring island of Jost Van Dyke, 16 nautical miles away.

This investigation was carried out by the UK Marine Accident Investigation Branch (MAIB) on behalf of the British Virgin Islands Government in accordance with the Memorandum of Understanding between the MAIB and the Red Ensign Group Category 1 registry of the British Virgin Islands.

Extract from the Virgin Islands Merchant Shipping (Accident Reporting and Investigation) Regulations 2020 – Regulation 13:

"The sole objective of a marine safety investigation is the prevention of future accidents through the ascertainment of its causes and circumstances. It is not the purpose of a marine safety investigation to determine liability nor, except so far as is necessary to achieve its objective, to apportion blame."

#### NOTE

This report is not written with litigation in mind and, pursuant to Regulation 24 of the Virgin Islands Merchant Shipping (Accident Reporting and Investigation) Regulations 2020, records obtained through the investigator's powers are inadmissible in any judicial proceedings whose purpose or one of whose purposes is to attribute or apportion liability or blame.

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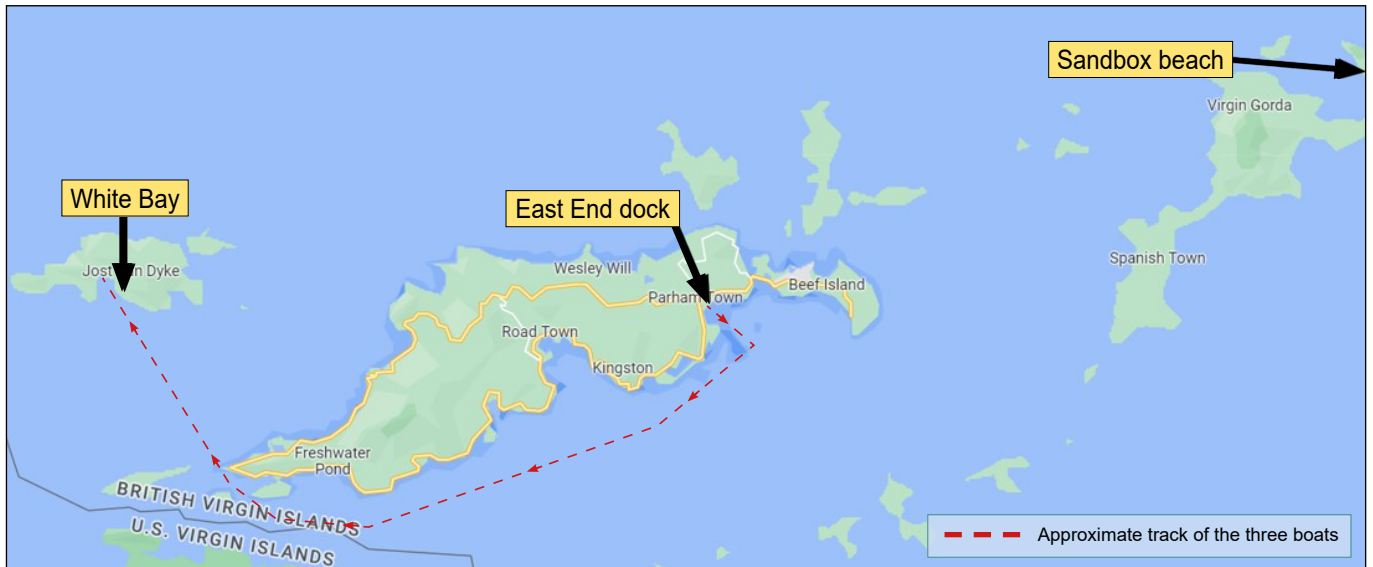
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**Figure 1:** Location and approximate route taken by *Awesome*

By about 1500, the three boats had arrived at White Bay. *Awesome* anchored with its stern facing the beach, while the other two boats were rafted along its port side (**Figure 2**). The group unloaded various items, including a barbecue grill, food and a sunshade, and spent the afternoon preparing food for the children and playing in the water.



**Figure 2:** *Awesome* anchored in White Bay, Jost Van Dyke on the day of the accident

As sunset neared, the group packed up and loaded the boats for the trip back to East End. At around 1800, the boats were untied from one another, and *Awesome's* anchor was retrieved. The silver-coloured midnight express was the first boat to depart, heading back at slow speed.

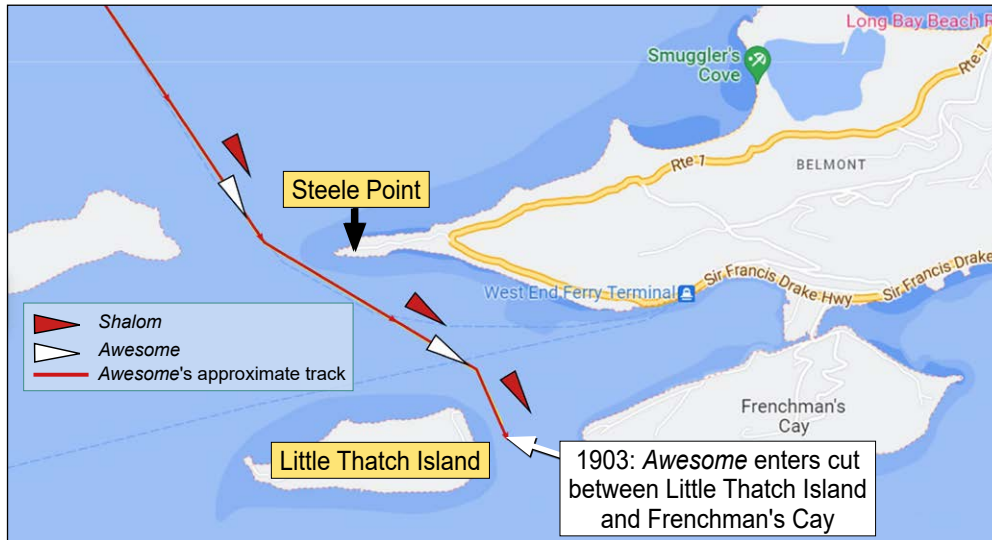
As *Awesome* and *Shalom* departed from the beach, *Awesome's* owner noticed that the engines were overheating and there was no expulsion of cooling water from the exhausts. The owner investigated and found that both engine water strainers were clogged with sand. The engines were shut down and each strainer housing was opened to remove the sand until the cooling water could flow freely. *Awesome's* engines were then restarted, and the owner checked that water was flowing out of the exhausts.

At about 1845, as the sun began to set, *Awesome* headed back to East End with eleven people on board, including four children. *Awesome* was the lead boat in a convoy with *Shalom* slightly off *Awesome's* port quarter.

### The accident

*Awesome* was travelling at about half speed as the two boats headed towards Steele Point (**Figure 3**) in the dark. At 1903, as *Awesome* entered the cut between Little Thatch Island and Frenchman's Cay, it turned very sharply to starboard, inducing a lateral slide, and tripped<sup>1</sup> to port violently, resulting in the ejection of ten of the eleven occupants. *Awesome* then reared up into a vertical position, with its bow in the air, landed back in the water on its transom, and then started to sink. The air trapped in the forward cabin briefly held the boat afloat vertically (**Figure 4**).

<sup>1</sup> A trip occurs when the keel of a boat sliding laterally grips the water, halting the slide and inducing a rapid roll towards the direction of travel.



**Figure 4:** Awesome partially sunk, bow up

### The search and rescue

A local fishing vessel was heading west from Frenchman's Cay at the time of the accident and the skipper had noticed *Awesome* and *Shalom* approaching, estimating that the powerboats were travelling at over 60 miles per hour (mph) before *Awesome* lost control. Witnessing the accident, the skipper immediately altered course towards the partially submerged *Awesome* and found several people in the water at the scene; some were struggling to keep their heads above the water, and none were wearing a personal flotation device (PFD). The skipper jumped into the water and assisted five people, one person at a time, to reach the fishing vessel. A crew member on board the fishing vessel helped to bring them on board.

The captain of a charter boat, which was returning from the island of Jost Van Dyke with guests on board, spotted the navigation lights of two boats ahead and heard people calling from the water for the charter boat to slow down. *Awesome's* bow was still protruding from the water as the charter boat approached the scene. The captain started to help the people in the water, one of whom screamed that some of *Awesome's* occupants were still missing. A few minutes later, at about 1915, *Awesome's* bow disappeared below the surface.

At about the same time, a local resident contacted Virgin Islands Search and Rescue (VISAR), the BVI's volunteer lifeboat organisation. The VISAR crew members were paged at 1917 and the lifeboat was launched 21 minutes later.

At 1924, a member of the public dialled 911 to notify the emergency services. The marine police unit and the ambulance service promptly mobilised and made their way by road to the West End ferry terminal, Tortola.

Nine of *Awesome's* occupants were quickly located and helped into various boats that had gathered at the scene. They were transported to the West End ferry terminal, where they were transferred into the care of the waiting emergency services. Due to the severity of their injuries many were taken to a local hospital for treatment. Two people, Brianna Graham and Kristal Black, remained unaccounted for and several vessels in the area joined the search for them.

A short while later, the crew of the charter boat found Brianna lying face down in the water and recovered her on board. Cardiopulmonary resuscitation was immediately started and continued as the charter boat made its way to the West End ferry terminal, arriving at about 1950. Brianna was transferred to the local hospital by a waiting ambulance where, at 2035, she was declared deceased.

At about 2230, and despite the continued search efforts of VISAR and other boats, the search for Kristal Black was suspended. All of the boats dispersed, and the VISAR lifeboat returned to its base at 2250.

The search resumed at about 0800 the next morning and involved VISAR, several boats, two specialist dive contractors and air assets from the United States Virgin Islands. The search areas included the accident site and the shoreline of Little Thatch Island.

### The salvage

The skipper of the fishing vessel that was first on the scene had used the boat's global positioning system (GPS) navigation equipment to record the position of *Awesome's* wreck. The water depth in the area ranged from 25m to 45m.

At 1000 on 3 October, specialist dive teams entered the water to conduct a thorough search of the seabed. Shortly after 1430, *Awesome* was briefly sighted at a depth of approximately 40m, but a strong current and diminishing light meant the divers had to resurface before they could attempt to approach the wreck. Further dives were halted due to worsening light conditions and the strength of the current. Diving operations resumed early the next morning and, at about 1130, *Awesome* was successfully located. At 1140, the divers found Kristal Black in the forward cabin and brought her body to the surface. There were no physical signs that Kristal was conscious or had attempted to escape the cabin when *Awesome* started to sink.

The following day *Awesome* was recovered from the seabed using inflatable air lift bags, lifted ashore by a crane and transported to the marine police compound in Road Town, BVI.

### Environmental conditions

At the time of the accident there was little wind, and the sea was flat calm. The air temperature was 29°C and the sea temperature was 27°C. It was dark with moonlight and visibility was good.

### The deceased

Kristal Black was 32 years old; *Awesome's* owner was in a relationship with her friend. Her postmortem stated it was likely that she was *incapacitated or suffered minor head trauma during the accident, which may have resulted in a loss of consciousness or disorientation*. The postmortem concluded that she was *presumed to have drowned*.

Brianna Graham was the 5-year-old niece of *Awesome's* owner. Her postmortem stated that *subdural haemorrhaging<sup>2</sup> had occurred as a result of minor head trauma caused during the accident*. The postmortem recorded Brianna's cause of death as drowning.

### The owner

*Awesome's* owner was an experienced leisure boater who had driven boats in the waters around the BVI for many years. The owner did not hold any formal boating qualifications and had not undertaken formal maritime navigation or safety training.

The owner had experience of working with engines and undertook most of the boat's maintenance, engaging the services of a local professional marine engineer to assist with more complex aspects.

### *Awesome*

Built in 1995, *Awesome* was a 37ft (11.3m) mono-hulled offshore powerboat weighing approximately 4.5 tonnes. *Awesome* was powered by twin supercharged Chevrolet V8 engines, each with a claimed 1,000-horsepower maximum output. The engines were mounted side by side in the rear section of the hull and were connected to Mercury Racing M6 stern drives via universally jointed drive shafts (**Figure 5**). The stern drives were mounted on standoff boxes and fitted with five-bladed, 34-inch pitch<sup>3</sup>, stainless steel surface-piercing propellers. A tie bar connected the stern drives to ensure they steered in the same direction.

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<sup>2</sup> Bleeding to the area between the brain and the skull.

<sup>3</sup> Pitch refers to the distance a propeller would move forward in one rotation if it were moving through a soft solid.

*Awesome* had been purchased by the owner in September 2021. Between November 2021 and August 2022 one of *Awesome*'s engines was refurbished and the other was replaced. In August 2022, *Awesome* was recommissioned and the owner subsequently used the boat most weekends before the accident, frequently attending local rallies and events. *Awesome* was a familiar sight in the BVI and was known to be capable of speeds in excess of 100 mph in ideal conditions. The owner claimed to have achieved a maximum speed of 98 mph on *Awesome* and that the boat's previous owner had reportedly driven it at 108 mph.

*Awesome* was fitted with a Raytheon marine GPS unit and a Livorsi Marine GPS speedometer; neither were working at the time of the accident, so the speed indicated on the speedometer dial after the accident was false. The owner used a mobile phone application for navigation and speed information.

### Seating

*Awesome* had seating capacity for five people. Two seats were located forward in the cockpit area, one on the port side and the other on the starboard side, which was also the driver's position. A further three seats were fitted in the aft of the cockpit, across the width of the boat (**Figure 6**).

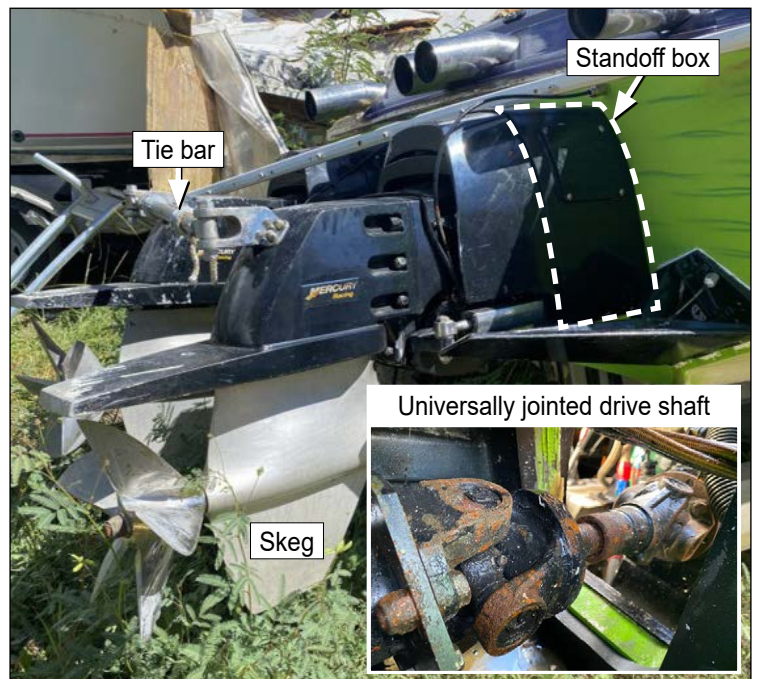
The two seats in the forward area of the cockpit were constructed of a tubular steel frame covered with thick foam padding that was upholstered in a vinyl type of fabric. On the back of each of the forward seats was a steel tubular handle. The three aft seats were built into the structure of the vessel and finished with the same thick foam padding and upholstery to form three distinct seats.

Kristal Black was seated on the port side of the rear seats with her 2-year-old child on her lap. There were three other adults sitting across the rear seats, totalling five people on three seats. Brianna was seated in the driver's seat and the owner was standing beside her. Two of the owner's friends were standing in the forward section of the cockpit and two boys (9 and 11 years old) were standing in front of the starboard single seat.

### Post-recovery inspection and safety equipment

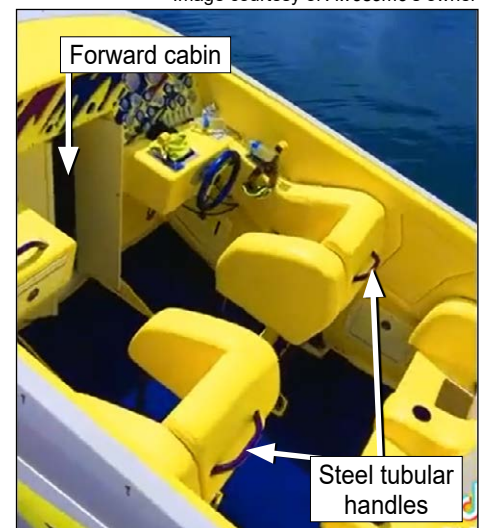
The Royal Virgin Islands Police Force engaged a local surveyor to inspect *Awesome* post-recovery and before the MAIB investigators attended. The surveyor found the port drive shaft from the stern drive to the gearbox lying in the bottom of the boat. On further inspection it was evident that a yoke on the aftmost universal joint had failed. The surveyor also noted that a hydraulic pressure hose near to the failed drive shaft had been severed.

The MAIB's post-recovery inspection of *Awesome* found pyrotechnic flares, a portable very high frequency (VHF) radio and several PFDs in the forward cabin space. The cables and linkages to and from the engines were in good order. Many of the electrical system connections had been displaced but it could not be determined whether this damage occurred during the accident or while the wreck was



**Figure 5:** The Mercury Racing M6 stern drive units and (inset) universally jointed drive shaft

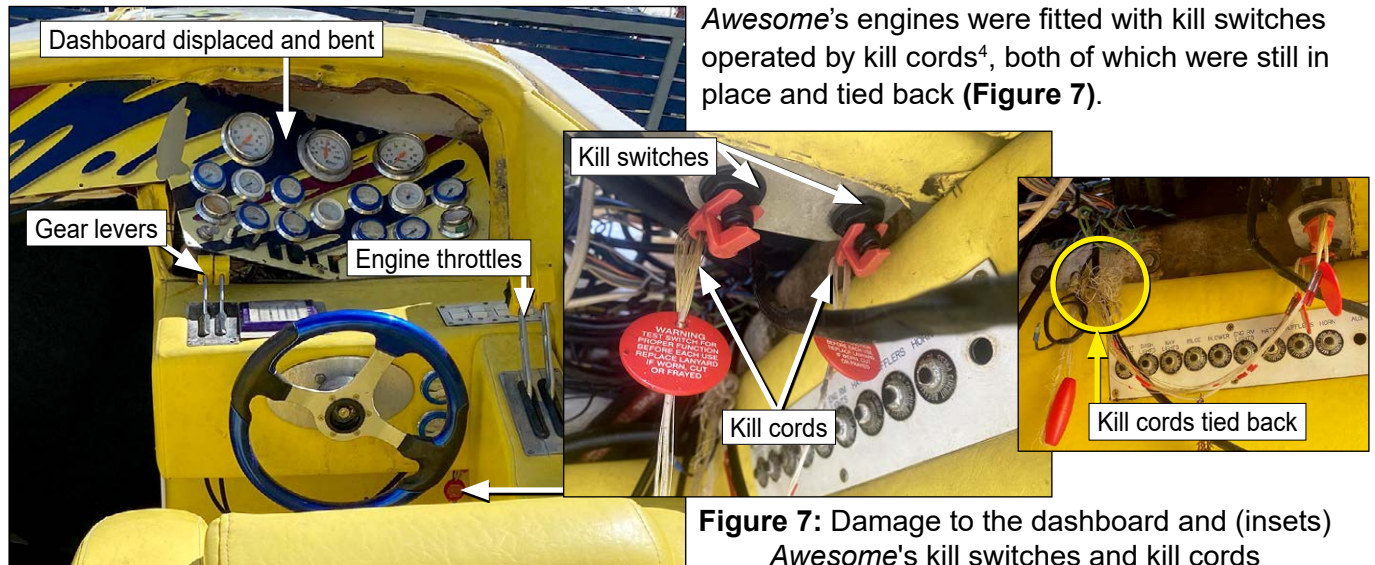
Image courtesy of *Awesome*'s owner



**Figure 6:** *Awesome*'s general seating arrangement

being recovered. Both drive shafts were examined by MAIB investigators who found that there was no evidence of the universal joints having been regularly greased.

Damage was noted to the dashboard in front of the driving position (**Figure 7**) and to the rear section of the port side of *Awesome's* hull. The engine cover was also missing. Some of the hull damage was known to have occurred during the wreck recovery operation. There was no damage to the bottom of the hull or to the propellers.



*Awesome's* engines were fitted with kill switches operated by kill cords<sup>4</sup>, both of which were still in place and tied back (**Figure 7**).

**Figure 7:** Damage to the dashboard and (insets) *Awesome's* kill switches and kill cords

Several mobile phones were recovered by divers from in and around the wreck. MAIB investigators found another mobile phone in the boat's console glove box. The phones were sent to a forensic testing laboratory, but all were badly damaged and no data could be recovered from any of the devices.

### Drive shaft failure

An independent expert was commissioned to analyse the failed drive shaft parts and prepare a report of their findings. The universal joints on both the failed port drive shaft, and the intact starboard drive shaft were stripped down for inspection. The report stated:

*Examination of the trunnions, bearings and bearing cups has shown evidence of over loading, overheating and corrosion of the bearings. Small amounts of old grease were found in the bearing housings, but all the bearing caps showed signs of burning and the trunnions showed signs of brinelling (bruising) due to a lack of lubrication. One of the oilways that carries grease to the bearings in the failed drive shaft universal joint was partly blocked with old hard grease.*

The report concluded:

*The failure was a sudden event, with no evidence of fatigue. A lack of lubrication caused a trunnion bearing to seize, leading to heavy wear of the trunnion and yoke, this is likely to have occurred over a prolonged period of time. The wear to the yoke reduced its cross-sectional area to a point where it could no longer transmit the level torque applied and suddenly failed. Examination of the remaining trunnions, bearings and bearing cups has shown evidence of over loading, overheating and corrosion of the bearings. It is considered that the failure of the bearings is the most likely cause of the incident.*

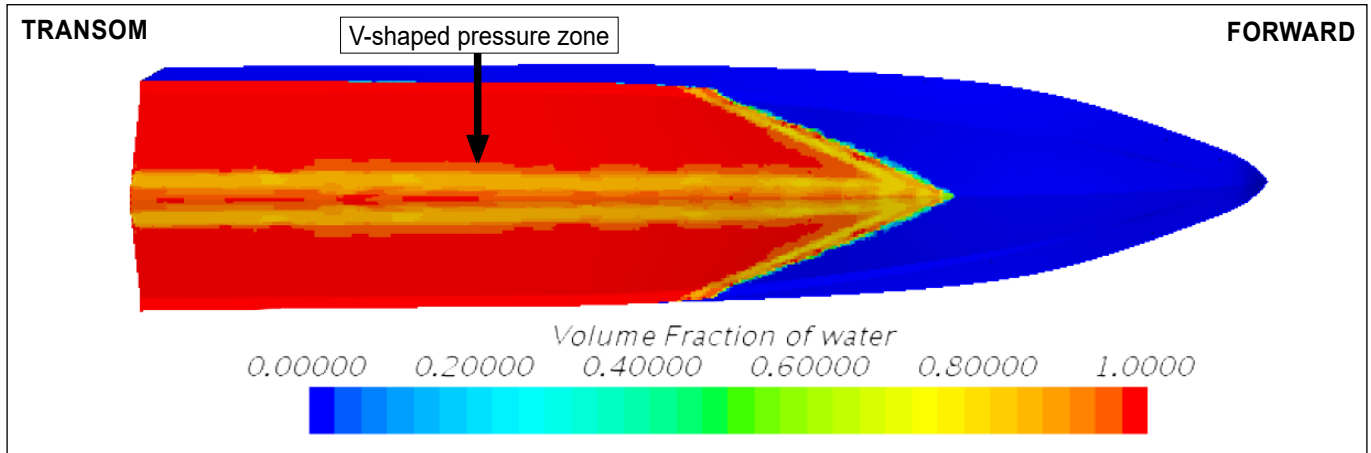
### Hull and drive characteristics

*Awesome's* single-stepped ventilated planing hull was designed to displace very little water when travelling over a certain speed so that the weight of the boat was supported by hydrodynamic lift rather than hydrostatic forces. A standard planing hull has one V-shaped pressure zone that projects forward

<sup>4</sup> Safety devices designed to be worn by the driver that could stop the engine if the driver was thrown overboard or away from the driving position.

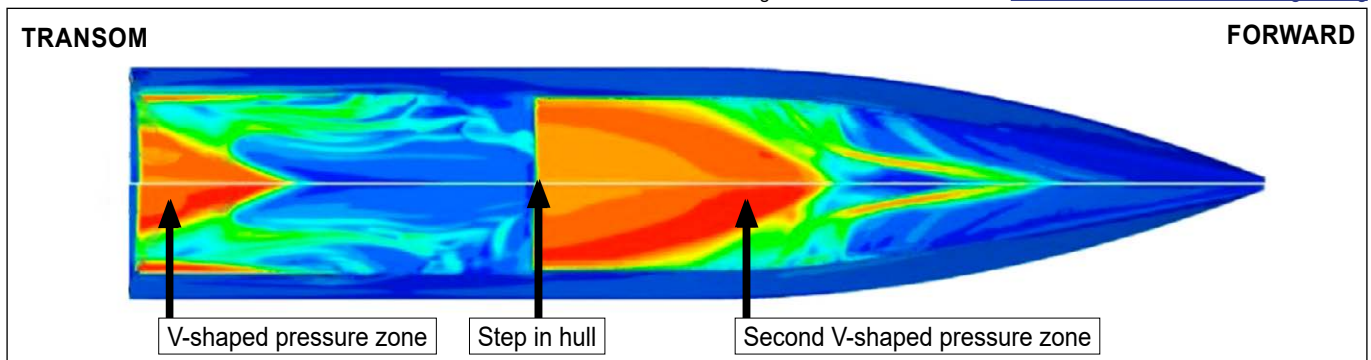
from the transom (**Figure 8**). The incorporation of a step into the hull allows air to be trapped between the hull's surface and the water, reducing drag. A stepped planing hull creates a second V-shaped pressure zone forward of the step (**Figure 9**). The two V-shaped pressure zones meant that *Awesome* lifted with less hull angle and moved flatter through the water. Additionally, the transmission of the drive force from the propellers to the water was done at a more favourable angle, increasing the boat's efficiency and speed.

Image taken from a study by Gray Stephens et al. 2021 (Journal of Offshore Mechanics and Arctic Engineering)



**Figure 8:** Pressure zone on a standard planing hull

Image taken from an article in the [Journal of Marine Science and Engineering](#)



The fitting of stern drive standoff boxes increased the length between the step in the hull and the propellers. This improved the straight-line performance of the vessel by moving the centre of gravity aft and raising the effective propeller height, thus reducing drag on the immersed parts of the drive units. Mounting the stern drives further aft also increased the steering leverage of the drives. This, coupled with the additional leverage due to the second V-shaped pressure zone forward of the step, might increase a boat's vulnerability to losing its grip on the surface of the water while making a tight turn at speed. The stern drive casings had been designed with large skegs (see **Figure 5**) on the lower edge to increase directional stability and improve turning ability when running at speed.



**Figure 9:** Pressure zone on a stepped planing hull and step in *Awesome's* hull

Two independent expert organisations were commissioned to assess the hull form of *Awesome* in combination with the engine and drive configuration, together with the estimated weight of the boat and its occupants. It was calculated that, in ideal conditions, *Awesome's* maximum achievable speed was 114 mph. It was established that *Awesome* would need to have been travelling at close to, or over, 60 mph for the hull to perform as witnessed during the accident.

*Awesome's* hull was of an older design; modern stepped hulls are designed with the step further forward or with multiple steps to break up the pressure zones.

## Steering system

The steering rams on both stern drive units were connected to a single hydraulic pressure system. Hydraulic pressure was maintained in the system by an engine-driven pump mounted on, and driven by, the port engine. The steering wheel was connected to a directional control pump and controlled the port and starboard movement of the stern drives. The system was not fitted with a fail-safe mechanism to lock the drives in case of a loss of pressure.

## Local regulations

### Speed

The internal waters of the BVI extend up to 12 miles offshore. All vessels operating in these waters were required to comply with the Convention on the International Regulations for Preventing Collisions at Sea, 1972 (COLREGs). Boat speeds were limited to 5 knots (approximately 6 mph) within the defined port areas of Road Harbour, St Thomas Bay, Soper's Hole, Great Harbour and Setting Point. Other than the obligation imposed by COLREGs Rule 6, to travel at a Safe Speed, there were no speed restrictions outside these areas.

### Certification and boat registration

The BVI did not require the owner or operator of a pleasure vessel to hold any formal qualifications to operate their vessel.

The Virgin Islands Shipping Registry (VISR) required pleasure vessels to undergo a pre-registration inspection by an authorised surveyor. The vessel's owner was required to present evidence of ownership and submit a declaration that the requisite safety equipment was carried on board. A certificate of registry would be issued on successful completion of the application process and the official registration details were required to be marked on the vessel.

There was no record of *Awesome* on the VISR register nor had an application for the boat's registration been submitted.

Hundreds of pleasure craft operated in BVI waters and VISR did not have the resources required to inspect and register them. As a result, many BVI pleasure vessels were not registered with VISR.

## ANALYSIS

### Aim

The purpose of the analysis is to determine the contributory causes and circumstances of the accident as a basis for making recommendations to prevent similar accidents occurring in the future.

### The accident

From witness testimony and expert analysis, it is probable that *Awesome* was travelling at about 60 mph when the port drive shaft universal joint failed, the flailing shaft then severed a steering system hydraulic pressure hose. This resulted in a loss of pressure in the steering system, which allowed both stern drive units to snap over to full starboard lock while *Awesome* was still travelling at about 60 mph.

*Awesome* turned sharply to starboard, which briefly lifted the stern of the hull clear of the water, allowing the boat to move laterally. As it landed, the hull suddenly gripped the surface of the water and caused the boat to trip violently to port and suddenly decelerate, ejecting everyone except Kristal Black from the boat.

As *Awesome* continued to move forward, driven by the starboard engine, eyewitness accounts confirmed that its bow reared up in the air with sufficient force for the boat to leave the water.

*Awesome* fell back into the water as momentum was lost, most likely with Kristal floating unconscious in the cockpit area. When *Awesome* sank, Kristal was washed into the forward cabin through its open door and became trapped.



Brianna was recovered unresponsive from the water and it is most likely she hit *Awesome's* dashboard during the accident and this rendered her unconscious.

It is possible that the position of the step in *Awesome's* hull and the fitting of the standoff boxes, to which the stern drives were mounted, added to the severity of the accident.

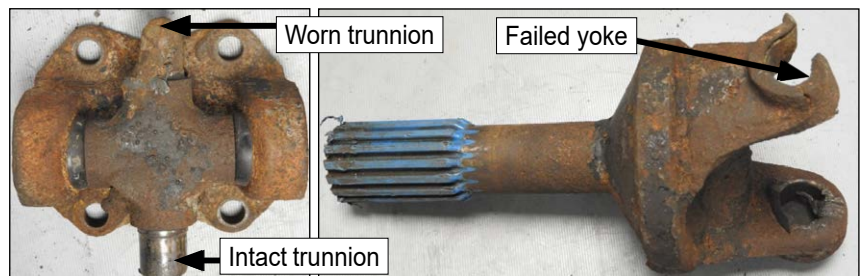
It is likely that the port side of the hull was damaged when it impacted the water at high speed during the violent roll to port, and that the engine cover became dislodged at the same time.

Other possible causes of the accident that were considered included wave action and collision with another vessel or debris in the water. The investigation found no evidence that *Awesome* came into contact with anything in the water and the sea state was flat calm. None of the vessels transiting the area at the time would have created a significant disturbing force on the sea's surface.

### Failure mechanism

In general, *Awesome* appeared well maintained at the time of the post-accident inspection. Much of the boat's routine maintenance was completed by the owner; however, they had no knowledge or awareness that the drive shaft universal joints required regular greasing maintenance. It is likely that the degradation of the port drive shaft yokes and trunnions started before the owner purchased *Awesome* and that further degradation had occurred during their ownership.

When inspected, all the universal joint trunnions showed signs of overheating, wear and corrosion to varying degrees. As number three trunnion on the port drive shaft started to wear and the running clearance within the bearing housing increased, there would be a cyclic impact loading with the trunnion hitting the bearings with every rotation of the shaft. With further use, the bearing would have disintegrated, and the trunnion would have then impacted on the cast steel yoke of the joint. This repeated impact led to plastic deformation of the trunnion and the degradation of the cast steel yoke, gradually reducing its cross-sectional area. On the day of the accident the cross-sectional area of the yoke had reduced to a level where it could no longer transmit the torque applied by the engine and it failed due to brittle fracture (**Figure 10**). With the yoke no longer holding the trunnion in place, the opposite trunnion was released from its bearing and the two halves of the universal joint violently separated while rotating at around 1500 revolutions per minute. The end of the drive shaft, still attached to the gearbox, was free to flail around and impacted the steering hydraulic hose located nearby, severing it.



**Figure 10:** Failed port drive shaft universal joint

### Steering

When the hydraulic pressure hose that supplied the port drive unit was severed, the pressure to the whole system would have been lost. With no locking or failsafe device fitted to these stern drive units as standard, the stern drives could flop from one side to the other once the hydraulic system was compromised. *Awesome's* propellers turned outwards, the starboard propeller turning clockwise. When the drive was lost on the port side, the starboard propeller's continued thrust would have immediately driven the stern drives to full starboard lock. As the drive units were secured together with a stainless steel tie bar, the turning effect generated by both stern drive skegs would have been present.

### Safety equipment and training

*Awesome* was equipped with several PFDs. However, none of *Awesome's* passengers were wearing a PFD at the time of the accident and many could not swim well. The swift response and prompt actions of the fishing vessel skipper and the charter boat captain likely prevented several other people from drowning.

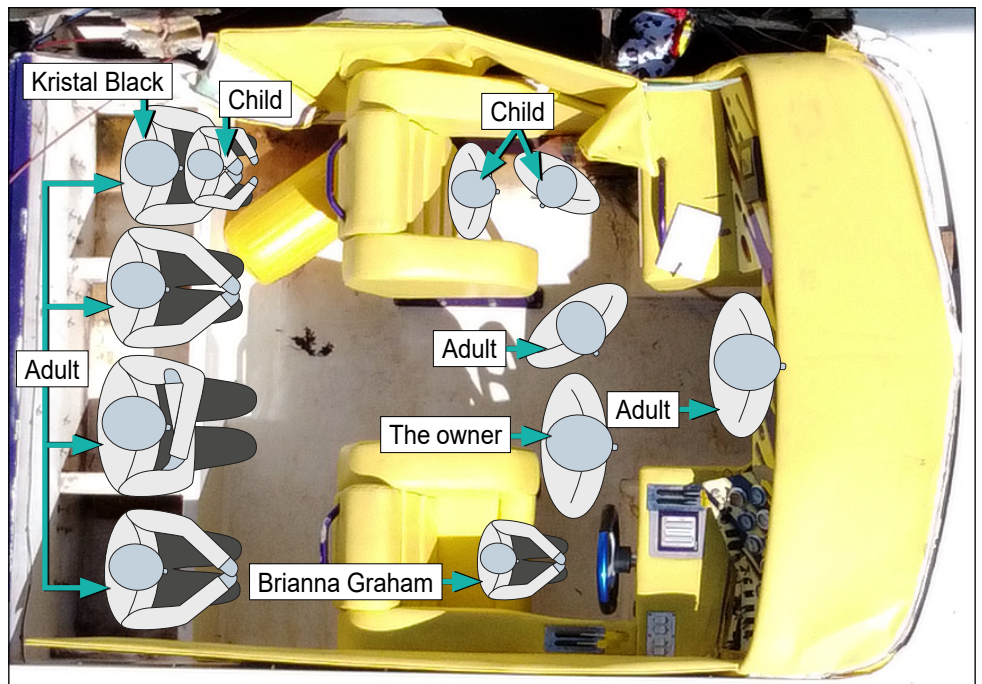
It is likely that both Brianna and Kristal were rendered unconscious during the accident. It is unknown whether wearing a PFD would have saved their lives; however, a PFD could have significantly improved their chances of survival.

*Awesome's* engines were equipped with kill switches, operated by kill cords that should have been clipped to the driver when the boat's engines were running. However, the kill cords were found to be still in place and tied back, indicating that they were not being used as intended. Had the kill cords been worn, the accident sequence might have been shorter and with a less serious outcome.

The owner had no formal qualifications and had not attended locally available training courses so relied on experience to operate *Awesome*. Instruction in the use of navigation and safety equipment and boat operations and limitations would have developed the owner's understanding of boat operations and limitations and enhanced their safety consciousness.

## Seating

*Awesome* had dedicated seating for five people in the cockpit area but at the time of the accident it was travelling with eleven people on board (**Figure 11**). There were four adults seated across the three rear seats, two children occupying the port side front seat area, and three adults were standing. Few, if any, were able to access dedicated handholds or benefit from the restraining nature of the seating. Kristal was holding her young son on her lap and this would have significantly compromised her ability to hold on or brace herself. It is likely that Kristal Black impacted the handle on the back of the port side front seat with sufficient force to knock her unconscious during the accident. When her body was found by the divers, her fingernails were intact and her arms and legs were not bruised, suggesting she was unconscious when she ended up in the cabin and had made no attempt to escape before she drowned.



**Figure 11:** Position of *Awesome's* occupants (post-salvage representation)

As Brianna was sitting in *Awesome's* driving seat, it is likely that her head impacted the dashboard during the accident, causing the subdural haemorrhage. It is probable that the impact rendered Brianna unconscious and this, coupled with the fact that she was not wearing a PFD, contributed to her drowning.

With Brianna seated in the driver's seat, the owner had to lean across her to access the engines' throttles while steering the boat with their right hand. The owner was therefore not in full control of the boat. When travelling at speed, it is good practice to always have one hand on the engine throttles and to steer with the other hand. Not having direct access to the steering and throttles while travelling at around 60 mph was unsafe, especially when not wearing the kill cords. It could not be determined whether the owner would have had time to react to the loss of the port drive shaft, but they would have had more opportunity to pull back both engine throttles to lessen the severity of the accident had they been sitting in the driver's seat.

The carrying of eleven people, some of them young children, on board a boat with dedicated seating for five put many of *Awesome's* passengers at significant risk of injury in the event of a crash. This risk was realised, and two people tragically lost their lives, when *Awesome* lost directional control while travelling at high speed.

### Hull characteristics

Boats with stepped hulls generally have less directional stability than those with standard planing hulls due to the shielding effect the step has on the water flow over the hull's surface. *Awesome's* directional stability relied on the skegs on the drive units (see **Figure 5**) and this would have been lost when the drives locked over to starboard and the skegs were working to turn the boat. The reduced immersed area of the hull aft meant that the turning leverage of the drives and skegs would have increased, making the hull react faster to the effect of the locked over drives.

*Awesome's* older hull design did not benefit from the research and testing that had been undertaken since the 1990s to evolve the design of the stepped planing hull. The modern designs, incorporating multiple steps and much smoother transitions between the hull and the step, are considered much safer than older designs as they operate with multiple smaller pressure zones that improve directional stability when traveling at speed.

## CONCLUSIONS

- *Awesome* unexpectedly turned to starboard because of a loss of steering control.
- Steering control was lost when a universal joint on the drive shaft from the port engine failed and the flailing drive shaft severed a steering system hydraulic pressure hose, resulting in a total loss of pressure in the steering system.
- The drive shaft coupling failed because it had become worn over a significant period of time due to a lack of routine lubrication.
- *Awesome* forcibly ejected ten of the eleven occupants because the hull lost its grip on the water when it veered sharply to starboard at high speed, which induced a lateral slide that arrested abruptly as the keel gripped the water triggering a violent roll.
- Kristal Black drowned because she became trapped in the forward cabin as *Awesome* sank. She was probably already unconscious as a result of impacting the back of the seat in front of where she was sitting.
- Brianna Graham drowned because she was not wearing a PFD that could have kept her head above water. She was most likely unconscious when she entered the water after her head impacted *Awesome's* dashboard during the accident.
- The swift action of the local fishing vessel skipper, charter boat captain and other boats that quickly arrived on scene likely prevented further loss of lives.
- The other injured occupants were fortunate to survive given that none were wearing PFDs and many could not swim proficiently.
- *Awesome* was equipped with cockpit seating for five people. With eleven people in the cockpit, and insufficient seating for all occupants, the boat was being operated unsafely.
- The accident required a combination of the loss of drive to the port propeller and the loss of steering control. Had only one or other occurred, or had the hydraulic steering system been fitted with a failsafe system, it is likely the outcome would have been much less severe.

## ACTION TAKEN

### MAIB actions

The MAIB has issued a safety flyer to pleasure craft users, highlighting the lessons to be learned from this accident.

## RECOMMENDATIONS

No recommendations have been made in this report.

## VESSEL PARTICULARS

Vessel's name	<i>Awesome</i>
Flag	Not applicable
Classification society	Not applicable
IMO number/fishing numbers	Not applicable
Type	Pleasure craft
Registered owner	Privately owned
Manager(s)	Not applicable
Year of build	1995
Construction	Glass reinforced plastic
Length overall	11.3m
Registered length	Not applicable
Gross tonnage	4.5
Minimum safe manning	Not applicable
Authorised cargo	Not applicable

## VOYAGE PARTICULARS

Port of departure	White Bay, Jost Van Dyke, British Virgin Islands
Port of arrival	East End dock, Tortola, British Virgin Islands (intended)
Type of voyage	Coastal
Cargo information	Not applicable
Manning	Not applicable

## MARINE CASUALTY INFORMATION

Date and time	2 October 2022 at about 1900
Type of marine casualty or incident	Very Serious Marine Casualty
Location of incident	Near Little Thatch Island, British Virgin Islands
Place on board	Not applicable
Injuries/fatalities	9 injured; 2 fatalities
Damage/environmental impact	Total constructive loss
Ship operation	Not applicable
Voyage segment	In passage
Environmental conditions	Light airs, flat calm sea; dark with moonlight; air temperature 29°C, sea temperature 27°C.
Persons on board	11