

Sinking of MV *Conception*

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Sinking of MV *Conception*

 [MV Conception burning.jpg](#)



The dive boat *Conception* burns off the coast of Santa Cruz Island, California, on September 2, 2019

Date	September 2, 2019
Time	Approximately 3 a.m. PDT UTC−07:00
Location	Platts Harbor, Santa Cruz Island, California , United States
Coordinates	34°02′51″N 119°44′06″W / 34.04750°N 119.73500°W Coordinates: 34°02′51″N 119°44′06″W / 34.04750°N 119.73500°W
Cause	Fire
Outcome	(See Aftermath section)
Deaths	34
Non-fatal injuries	5

Location of collision in Channel Islands:

 [MV Conception is located in USA](#)
 [California Channel Islands](#)

Map of the [Channel Islands, California](#), with sinking site marked in red.

 [MV Conception is located in California](#)
 [MV Conception \(California\)](#)

The **sinking of MV *Conception*** occurred on September 2, 2019, when the 75-foot (23 m) [dive boat](#) caught fire and eventually sank off the coast of [Santa Cruz Island, California](#), United States. The boat was anchored overnight at Platts Harbor, a small undeveloped bay on the north shore of the island, with 33 passengers and 1 crew member asleep below decks when fire broke out shortly after 3 a.m. Five of the crew members, whose sleeping quarters were on the top deck, were forced by the fire to jump overboard but not before placing an initial mayday call to the Coast Guard and attempting to alert the passengers. The crew retrieved the *Conception's* skiff and motored to a nearby boat where a second radio dispatch was made. The loss of the boat spurred a rescue operation by the [United States Coast Guard](#).^{[1][2]}

It is the worst maritime disaster in California since the sinking of the [Brother Jonathan](#) in 1865, and the deadliest in the United States overall since the [USS Iowa turret explosion](#) in 1989.^[3]

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Boat[[edit](#)]

The *Conception* anchored at [Avalon, Santa Catalina Island](#), in May 2000

MV Conception was a 75-foot (23 m) [liveaboard](#) boat built in [Long Beach, California](#), and launched in 1981.^[4]^[5] It was one of three dive boats owned by Truth Aquatics, which operates charter excursions from [Santa Barbara Harbor](#) for groups of divers interested in exploring the [Channel Islands](#), located close to the coast of Southern California across the [Santa Barbara Channel](#) from Santa Barbara and [Ventura County](#).^[6] *Conception* was under charter to Worldwide Diving Adventures (WDA) for a three-day [scuba diving](#) excursion over the [Labor Day](#) holiday weekend, which was one of WDA's most popular diving tour packages.^{[7][8][9]} The boat had been refurbished at a cost of more than \$1 million following an incident in 2005 when it had been stolen and run aground.^[10]

Federal and international regulations require boats over a certain size to be made of fire resistant materials and to include fire sprinklers and smoke detectors wired into the ship's electronics or linked to the bridge. Given the vessel's age and size, *Conception*, at less than 100 [GT](#) and with fewer than 49 berths, was not covered by those regulations. It was constructed of wood covered with [fiberglass](#), as permitted by regulations last updated in 1978.^{[11][12]} At the time of the fire, *Conception* was believed to be in compliance with those regulations, and the most recent Coast Guard inspections in February 2019 and August 2018 did not result in any noteworthy violations.^{[13][14][11]} According to the vessel's Certificate of Inspection, it had a maximum capacity of 103: 4 crew and 99 passengers; one crewmember was required to be designated as a roving patrol at all times when the passenger bunks were occupied.^[15]

Conception lower deck
bunk room, starboard side
facing aft, from a May
2003 dive trip

The boat was laid out with three decks. The upper sun deck contained the [wheelhouse](#). The main deck, just below the sun deck, included a large cabin, which had a galley (in the forward portion of the cabin) where the crew could prepare meals and a salon (in the aft portion) with seating for meals.^[14] On the lower deck, up to 46 individuals could sleep in 13 double bunks (12 of which were stacked in twos) and 20 single bunks (18 stacked in threes), with one labeled as reserved for crew.^{[4][10]} The rest of the crew berths were located two decks above, in the [aft](#) portion of the wheelhouse on the sun deck.^[14]

According to the deck plans, the main access to the guest accommodations was the forward stairway connected to the galley and main deck cabin.^[4] The designer of the vessel stated that there were two exits from the bunk room: a forward staircase at the bow end of the vessel that led up to the galley area, and an aft escape hatch located above one of the bunks, which led to the salon. After exiting the aft escape hatch, a person would still be within the main deck cabin, approximately 3 to 4 feet (0.91 to 1.22 m) forward of the exit to the main deck.^[16] Some former dive passengers could only recall the forward stairway exit and could not recall if they had been briefed on the presence of the aft emergency escape hatch.^[17] [Santa Barbara County Sheriff](#) Bill Brown stated both exits appeared to have been blocked by fire during the disaster.^[18]

Fire^[edit]

On the night of the fire, a crew member sleeping in the crew quarters on the sun deck awoke to the sound of a pop in the dark and believed it to be a disoriented crew member or passenger. Upon leaving his bed to attempt to aid the individual, he discovered an uncontrollable fire in the ship's galley, inside the main deck cabin.^[10] The fire had already spread to the aft end of the sun deck.^[19] The crew member returned to wake the remaining crew on the sun deck,^[19] and two [mayday](#) calls were placed at approximately 3:15 a.m. from the wheelhouse of the *Conception*.^{[18][20]} The five crew members that had been sleeping on the sun deck were unable to descend to the main deck, as the aft ladder was already engulfed in flames; they instead jumped down to the main deck and one broke his leg in the process.^[21]

The ship's captain said the aft escape hatch was engulfed in fire and the surviving crew could do nothing to help the passengers and one crew member sleeping in the lower deck berths.^{[22][23]} The crew then attempted to access the main deck cabin through a window in the forward section of the boat, but were thwarted by thick smoke; flames prevented the crew from getting any closer to rescuing the trapped passengers.^{[21][24]} The five crew members leapt into the ocean from the bow to escape the fire; two and the captain retrieved the boat's skiff (an inflatable [dinghy](#)) from the stern, and, after retrieving the remaining crew, paddled approximately 200 yards (180 m) to the only boat moored nearby, *The Grape Escape*.^{[8][19][20]}

The surviving crew put out another mayday alert from *The Grape Escape* and two of the crew returned to the *Conception* in the skiff to search for survivors.^{[10][25]} While waiting for aid, small explosions were heard from the *Conception*, believed by the crew to be caused by the pressurized dive cylinders rupturing from the heat of the fire.^[8] One of the distress calls sent from the *Conception* initially suggested that at least one individual below deck was awake, as a man's voice was recorded screaming "Mayday! Mayday! Mayday! I can't breathe!"^[26] However, Glen Fritzier, the owner of Truth Aquatics, clarified the first mayday calls had been made by the captain of the *Conception* from the wheelhouse before he evacuated from the boat.^{[18][27]}

USCGC *Narwhal* at Santa Cruz Island (September 2019)

Coast Guard Sector Los Angeles–Long Beach received the mayday calls at approximately 3:30 a.m. The call was received via [Channel 16 VHF](#), advising that a 75-foot commercial dive vessel was fully engulfed in flames with 39 remaining on board.^[28] Boats and helicopters from the Coast Guard, the [Ventura County](#) and [Santa Barbara County Fire Departments](#), and a private company, TowBoatUS Ventura (formerly Vessel Assist Ventura) were dispatched to the site.^[29] After arriving onsite, officials struggled to fight the fire, as the boat was in a remote location with limited firefighting resources, and the fire was moving quickly and kept flaring up.^[30] The anchor line of the *Conception* burned through and the boat began to drift towards the island, raising fears it might ignite onshore vegetation. In addition, since *Conception* had drifted into shallower waters, most of the

fireboats on-scene were unable to continue fighting the fire for lack of clearance, including a shallow-draft Santa Barbara Harbor Patrol boat.^[31]

In order to attempt to fight the fire and allow fireboats to reach the vessel, it was towed out to deeper water by the rigid hull inflatable operated by TowBoatUS.^{[30][31]} The fire was extinguished by 5:23 a.m.^[32] The [Coast Guard cutter *Narwhal*](#), based in [Corona Del Mar](#), arrived approximately two hours after being dispatched and remained onsite for four days as the command and control ship to coordinate rescue and recovery operations.^[33]

The fire had burned to the waterline of the hull, which was also full of water from firefighting efforts. The hulk was not stable enough to place pumps on board to dewater it. *Conception* was then towed by the TowBoatUS vessel back to shallower waters to aid in its recovery,^[31] but the boat sank about four hours after the fire broke out,^[8] coming to rest upside-down at a depth of 64 feet (20 m) approximately 20 yards (18 m) from the north shore of Santa Cruz Island.^[7] The Coast Guard suspended their search for survivors at 9:40 a.m. on September 3 after spending 23 hours combing 160 sq mi (410 km²) of the waters north of Santa Cruz Island with five [MH-65 Dolphin](#) helicopter crews, two [Response Boat – Medium](#) crews, and the USCGC *Narwhal*.^[34]

Victims^[edit]

Of the 33 passengers and six crew members that were on board the vessel, all 33 passengers and one crew member were killed the night of the fire, with five crew members escaping with injuries. As of September 2, Coast Guard divers located 25 bodies, while nine other people remained missing. Four floating bodies were initially recovered at the time of the sinking, and another sixteen were pulled from the water later. Another five bodies were visible in the vessel but unreachable because of concerns about unsafe conditions on the boat.^[30] The Coast Guard suspended search efforts on the morning of September 3, as it required the wreckage to be stabilized before searching it for further bodies. The unaccounted victims have been presumed dead.^{[35][23]} By September 4, all but one of the bodies had been recovered, with around thirty local divers and members of the [Federal Bureau of Investigation](#) (FBI) assisting in the search for the last body.^[36] The last body was located and recovered on September 11.^[37]

Most of the victims were from California. One couple was from [Arizona](#).^[38] Two of the victims were confirmed to be [Singaporean](#).^[39] Two victims were from India, living in [Stamford](#).^[40] Two of the victims are believed to have been students.^[41] It is believed that the youngest was age 16 and the oldest were in their 60s, with a majority of the victims from [Santa Cruz](#) and the [Bay Area](#).^[42]

[DNA was collected](#) from family members to be used by the Santa Barbara County coroner to identify the bodies.^[43] Identification was delayed by the loss of the onboard passenger manifest and difficulties by law enforcement in initially locating a second copy.^[11] Twenty-three of the bodies were identified with the assistance of a private company that had developed a form of [rapid DNA](#) technology previously used to identify [Camp Fire](#) victims.^[11] All 34 victims were identified by September 12.^[44] The coroner determined that the cause of death was [smoke inhalation](#).^{[45][46][47]}

Investigation^[edit]

Conception photographs from summer 1995

Bunk room and aft escape hatch (above bunk #10), view directed portside.

Main deck, view towards bow
into salon. Aft escape hatch
exit is centered just inside the
main deck cabin.

Truth Aquatics was considered a respectable business in the area, with their boats in good condition, according to [state Senator Hannah-Beth Jackson](#), who represents the Santa Barbara area.^[38] Local entrepreneur Ken Kurtis, owner of a dive charter company, told *The Maritime Executive* it was the only major fire he was aware of on a Californian dive boat and the issue was not widely contemplated by the local industry.^[12] U.S. Senator [Dianne Feinstein](#) called for an investigation into the incident and specifically wants to address the training of the crew and why they were not able to rescue or alert the passengers. She also wants to see if additional regulations are needed to prevent similar tragedies in the future. Via press release, Feinstein stated "It's inconceivable that with all the safety regulations we have in place today, a fire on a boat can lead to the loss of life we saw this morning near Santa Cruz Island".^{[48][49]}

The [National Transportation Safety Board](#) (NTSB) launched a go team on September 3 to the accident to investigate. The on-scene portion of the investigation is scheduled to last for ten days, with the objective to determine the cause of the fire and verify the safety measures that had been aboard *Conception*.^[38] The [Coast Guard](#) launched its own safety investigation focused principally on regulation adherence and on determining if enforcement action was required.^[50] The NTSB and other authorities toured the *Conception's* sister ship *Vision*, also owned by Truth Aquatics, to evaluate how it might be evacuated in the event of a fire.^[36] During the tour of *Vision*, NTSB Member Jennifer Homendy was "taken aback" by the difficulty of using the aft escape hatch. "You have to climb up a ladder and across the top bunk and then push a wooden door up. It was a tight space."^[51] Speaking on September 3, Member Homendy said she was "one hundred percent confident that we will learn the why and the how" behind the accident.^[50]

NTSB official using the aft
(salon) escape hatch on sister dive
boat *Vision*.

Agents with the [Bureau of Alcohol, Tobacco, Firearms and Explosives](#) (ATF) immediately responded, but investigatory agents did not arrive until September 7, to investigate the point of ignition and cause of the blaze.^[11] Search warrants were served on September 8 for the Truth Aquatics offices and the two remaining boats in its fleet.^[32] On September 9, law enforcement sources told the [Los Angeles Times](#) that a joint federal criminal investigation was underway, led by the Coast Guard, joined by the FBI and ATF, and under the oversight of the [United States Attorney](#) for Los Angeles. The focus of the investigation is on records retrieved from the offices of Truth Aquatics, prompted by a preliminary investigation which indicated potential deficiencies in crew training, passenger safety briefings, and the failure to use a roaming "night watchman".^[52]

On September 11, the Coast Guard announced it had convened a formal [Marine Board of Investigation](#) (MBI) for the fire and loss of *Conception*. The four members of the MBI will determine contributing factors, including whether the actions of certified people or any Coast Guard or government personnel may have contributed to the loss.^[53]

The wreck was examined by government officials after it was retrieved and brought to [Port Hueneme](#) on September 13; the ATF examination concluded September 27, but no immediate cause of the fire was determined.^[54] Some parts of the boat have been removed and sent to laboratories for further examination.^[55]

Salvage[\[edit\]](#)

DB *Salta Verde* at Santa Cruz Island (September 2019)

[Derrick barge](#) *Salta Verde* ([MMSI number: 367507960](#)) arrived at Santa Cruz Island to assist with the [salvage operation](#) on September 4.^[56] Divers examined the wreckage to prepare to raise it, but high winds and heavy seas hampered the recovery plans.^[24] *Conception* had settled on the bottom upside-down; the first attempt to roll the boat upright and raise it was planned for September 6, but recovery efforts would have been delayed if the windy conditions had continued.^[46] The FBI assisted this portion of the investigation due to their experience in evidence preservation.^[11] [Side-scan sonar](#) was used to image the boat *in situ* and video was taken of the undisturbed wreckage prior to lifting.^[14] Divers were required throughout the process to monitor the lift and look for the last victim.^[11]

Conception was rolled upright while underwater on September 6. Continued adverse weather conditions prevented the raising of the wreck^[32] until it was lifted from the sea on September 12.^[57] DB *Salta Verde* transported the boat to a secure location at [Naval Base Ventura County](#) through the [Port of Hueneme](#) by September 13.^[58]

Cause^[edit]

Aft wall of main deck cabin on sister dive boat *Vision*, showing bookcase and power strips for charging electronics

The NTSB expects to conclude its investigation and declare a cause after twelve to eighteen months of investigations.^[59] One of the surviving crew members theorized the fire may have started in the galley of the ship, where cellphones and cameras had been plugged in to charge overnight. The designer of the vessel speculated the fire began in the bunk area, possibly sparked by a lithium battery.^[16] Boats made at the time the *Conception* was built were not installed with electrical systems that could handle the amount of rechargeable devices that would have been had by the passengers, between cell phones, cameras, and lighting systems for their dives. The sheer number of devices charging at once may have overloaded circuits, coupled with the hazards from [lithium-ion battery](#) overloading.^[60]

The NTSB expects to take remnants of any devices charging in the boat to their headquarters near Washington, D.C. for further examination.^[11] On September 10, the Coast Guard issued Marine Safety Information Bulletin (MSIB) 008-19, immediately advising owners, operators, and masters of passenger vessels to limit "the unsupervised charging of lithium-ion batteries and extensive use of power strips and extension cords."^[61]

Areas of concern^[edit]

While there were [smoke detectors](#) on the *Conception*, the surviving crew did not believe any alarms sounded before they discovered the fire. The detectors were of the standard type for home use, which, at the time both *Conception* and *Vision* were built, met existing safety requirements.^[62] MSIB 008-19 also advised that firefighting and lifesaving equipment should be checked immediately to ensure it is onboard and operational.^[61] According to the preliminary NTSB report, the two smoke alarms were locally-sounding, located in the lower deck bunkroom.^[19]

The boat was not at capacity, but according to the *Los Angeles Times*, the preliminary investigation identified the lack of a roaming [night watch](#) as a safety deficiency,^{[62][63]} in violation of the conditions in the Certificate of Inspection^[15] and [46 C.F.R. § 185.410](#).^[64] MSIB 008-19 advised owners, operators, and masters to review the vessel's Certificate of Inspection to ensure that crewmembers are aware of and understand any conditional requirements, including any crewmember obligations during an emergency. In addition, emergency escapes were to be clearly identified, verified functional, and free of obstructions.^[61]

Preliminary report^[edit]

NTSB issued a preliminary report on the fire on September 12.^[19] While the cause of the fire had not yet been determined, the Board asserted that the fire had spread through the boat while all of the crew had been asleep, despite regulations requiring one crew member to be awake on night watch.^[65] A lawyer representing Truth Aquatics disputed this assertion, and stated that one crew member had checked on the galley area around 2:30 a.m. on September 2.^[44] Officials believed that all of the passengers and the crew-member sleeping below decks had died from smoke inhalation before they were burned or drowned.^[47]

Aftermath^[edit]

California Governor [Gavin Newsom](#) issued a statement through [Twitter](#) praising the efforts of the emergency medical workers and offering his condolences to the families and loved ones affected.^[26]

A makeshift memorial was created outside the headquarters of Truth Aquatics in Santa Barbara Harbor.^{[30][36]} A vigil was scheduled for September 6 with first responders taking part in the open-to-all event, which was organised by local religious groups, divers, and other organisations.^[66]

Truth Aquatics suspended operations on their remaining two boats following the disaster.^[24] The voluntary suspension was made indefinite in October 2019.^[67]

The [United States House of Representatives Subcommittee on Coast Guard and Maritime Transportation](#) held a hearing on November 14, 2019 to discuss commercial and passenger vessel safety.^[68] Brian Curtis, the director of the NTSB's Office of Marine Safety, testified before the Subcommittee, reiterating the investigation into the sinking of *Conception* was still in progress and that it would focus on the wreck itself as well as other factors such as current regulations, fire alarm and warning systems, evacuation routes, training, and company policies and procedures.^[69] Members of the Subcommittee asked the Coast Guard representative, Rear Admiral Richard Timme, what actions the Coast Guard was taking after the *Los Angeles Times* published an investigative story on November 12 stating the Coast Guard had often failed to implement safety recommendations from the NTSB.^[70] In response, Timme vowed the Coast Guard would "wholly fulfill our regulatory oversight role to keep the maritime public safe" and would adopt new regulations immediately after they are published by an internal task force developing inspection rules for vessels similar to *Conception*.^[71]

Legal actions^[edit]

Truth Aquatics also filed a lawsuit in the [United States District Court for the Central District of California](#) to limit its liability under the [Limitation of Liability Act of 1851](#). This was an apparent attempt to limit its liability for monetary damages to the value of the ship.^[72] Under the terms of the lawsuit, the ship valuation was assessed after it sank; because the insurer had deemed it a total wreck, the value was US\$0. A counterclaim was filed in November 2019 by the spouse of a passenger who died aboard *Conception*, seeking funeral expenses and wrongful death, survival, and [punitive damages](#).^[73]

Soon after the incident, one of the surviving crew members from *Conception* filed a lawsuit against Truth Aquatics, Worldwide Diving Adventures, and the *Conception's* owner, claiming that the crew had not received proper training nor was the boat outfitted with appropriate emergency equipment.^[74] In January 2020, attorneys representing the families of four diver/passenger victims also filed, citing that "The defendants killed these victims by breaking the law and failing to have a roving night watch whose job was to prevent the very catastrophe that occurred."^[75]

See also^[edit]

- [List of maritime disasters in the 21st century](#)
- [List of shipwrecks in 2019](#)
- [List of transportation fires](#)

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- ["Events Archive"](#). *Truth Aquatics*. September 3, 2019. Retrieved September 3, 2019.
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Investigation^{[[edit](#)]}

- [NTSB Member Jennifer Homendy's First California Dive Vessel Fire Media Brief](#) on [YouTube](#)
- [NTSB Member Jennifer Homendy's Second California Dive Vessel Fire Media Brief](#) on [YouTube](#)
- [NTSB Member Jennifer Homendy's Third California Dive Vessel Fire Media Brief](#) on [YouTube](#)
- [NTSB B-Roll of Member Homendy and Investigators Touring Similar Vessel](#) on [YouTube](#) Tour of *Vision*, showing aft (salon) escape hatch and sun deck.

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- 1 Jun: [Lintas Timur](#)
- 2 Sep: [Conception](#)

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- 1 Jan: [MSC Zoe](#)
- 23–24 Mar: [Viking Sky](#)
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- 12 May: [May 2019 Gulf of Oman incident](#)
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Underwater weapons

Underwater firearm

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Diver organisations

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- [Confédération Mondiale des Activités Subaquatiques](#) (CMAS)
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- [Fédération Française d'Études et de Sports Sous-Marins](#) (FFESSM)
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- [Antilla](#)

- [*Antilles*](#)
- [*Aquila*](#)
- [*USS Arkansas*](#)
- [*HMS Boadicea*](#)
- [*Bianca C.*](#)
- [*Booya*](#)
- [*HMSAS Bloemfontein*](#)
- [*Breda*](#)
- [*HMAS Brisbane*](#)
- [*HMHS Britannic*](#)
- [*Bungsberg*](#)
- [*HMAS Canberra*](#)
- [*Carl D. Bradley*](#)
- [*Carnatic*](#)
- [*SMS Dresden*](#)
- [*Dunraven*](#)
- [*Eastfield*](#)
- [*HMT Elk*](#)
- [*Ellengowan*](#)
- [*RMS Empress of Ireland*](#)
- [*HMS Falmouth*](#)
- [*Fifi*](#)
- [*SS Francisco Morazan*](#)
- [*Fujikawa Maru*](#)
- [*Fumizuki*](#)
- [*SATS General Botha*](#)
- [*USNS General Hoyt S. Vandenberg*](#)
- [*HMS Ghurka*](#)
- [*Glen Strathallan*](#)
- [*SAS Good Hope*](#)
- [*Gothenburg*](#)
- [*Herzogin Cecilie*](#)
- [*Hilma Hooker*](#)
- [*Hispania*](#)
- [*HMS Hood*](#)
- [*HMAS Hobart*](#)
- [*Igara*](#)
- [*James Eagan Layne*](#)
- [*Captain Keith Tibbetts*](#)
- [*King Cruiser*](#)
- [*SMS Kronprinz*](#)
- [*Kyarra*](#)
- [*HMS Laforey*](#)
- [*USAT Liberty*](#)
- [*Louis Sheid*](#)
- [*USS LST-507*](#)
- [*SMS Markgraf*](#)
- [*Mikhail Lermontov*](#)
- [*HMS M2*](#)
- [*Maine*](#)
- [*Maloja*](#)
- [*HMS Maori*](#)
- [*Marguerite*](#)
- [*SS Mauna Loa*](#)

- [*USAT Meigs*](#)
- [*Mendi*](#)
- [*USCGC Mohawk*](#)
- [*Mohegan*](#)
- [*RMS Moldavia*](#)
- [*HMS Montagu*](#)
- [*MV RMS Mulheim*](#)
- [*Nagato*](#)
- [*Oceana*](#)
- [*USS Oriskany*](#)
- [*Oslofjord*](#)
- [*P29*](#)
- [*P31*](#)
- [*Pedernales*](#)
- [*Persier*](#)
- [*HMAS Perth*](#)
- [*SAS Pietermaritzburg*](#)
- [*Pilsudski*](#)
- [*Pool Fisher*](#)
- [*HMS Port Napier*](#)
- [*Preußen*](#)
- [*President Coolidge*](#)
- [*PS Queen Victoria*](#)
- [*Radaas*](#)
- [*Rainbow Warrior*](#)
- [*RMS Rhone*](#)
- [*Rondo*](#)
- [*Rosehill*](#)
- [*Royal Adelaide*](#)
- [*Royal Charter*](#)
- [*Rozi*](#)
- [*HMS Safari*](#)
- [*Salem Express*](#)
- [*USS Saratoga*](#)
- [*USS Scuffle*](#)
- [*HMS Scylla*](#)
- [*HMS Sidon*](#)
- [*USS Spiegel Grove*](#)
- [*Stanegarth*](#)
- [*Stanwood*](#)
- [*Stella*](#)
- [*HMAS Swan*](#)
- [*USS Tarpon*](#)
- [*Thesis*](#)
- [*Thistlegorm*](#)
- [*Toa Maru*](#)
- [*Torrey Canyon*](#)
- [*SAS Transvaal*](#)
- [*U-40*](#)
- [*U-352*](#)
- [*U-1195*](#)
- [*Um El Faroud*](#)
- [*Varvassi*](#)
- [*Walter L M Russ*](#)

Cave diving sites	<ul style="list-style-type: none"> • Washingtonian (1913). • HMNZS Wellington • USS Yancey • Yongala • Zenobia • Zealandia • Zingara <ul style="list-style-type: none"> • Chinhoyi Caves • Devil's Throat at Punta Sur • Engelbrecht Cave • Fossil Cave • Piccaninnie Ponds • Pollatoomary • Sistema Ox Bel Ha • Sistema Sac Actun • Sistema Dos Ojos • Sistema Nohoch Nah Chich
Freshwater dives	<ul style="list-style-type: none"> • Dutch Springs • Ewens Ponds • Little Blue Lake
Training sites	<ul style="list-style-type: none"> • Capernwray Dive Centre • National Diving and Activity Centre • Stoney Cove
Open ocean diving	<ul style="list-style-type: none"> • Blue-water diving • Black-water diving

[Diving safety](#)

- [Human factors in diving equipment design](#)
- [Human factors in diving safety](#)
- [Life-support system](#)
- [Safety-critical system](#)

[Diving hazards](#)

- [List of diving hazards and precautions](#)
- Environmental
 - [Current](#)
 - [Delta-P](#)
 - [Entanglement hazard](#)
 - [Overhead](#)
 - [Silt out](#)
 - [Wave action](#)
- Equipment
 - [Freeflow](#)
 - [Use of breathing equipment in an underwater environment](#)
 - [Failure of diving equipment other than breathing apparatus](#)
 - [Single point of failure](#)

- Physiological
 - [Cold shock response](#)
 - [Decompression](#)
 - [Nitrogen narcosis](#)
 - [Oxygen toxicity](#)
 - [Seasickness](#)
 - [Uncontrolled decompression](#)
- [Diver behaviour and competence](#)
 - Lack of [competence](#)
 - [Overconfidence effect](#)
 - [Panic](#)
 - [Task loading](#)
 - [Trait anxiety](#)
 - [Willful violation](#)

Consequences

- [Barotrauma](#)
- [Decompression sickness](#)
- [Drowning](#)
- [Hypothermia](#)
- [Hypoxia](#)
- [Hypercapnia](#)
- [Hyperthermia](#)

- [Ascending and descending](#)
 - [Emergency ascent](#)
- [Boat diving](#)
 - [Canoe and kayak diving](#)
- [Buddy diving](#)
 - [buddy check](#)
- [Decompression](#)
 - [Decompression practice](#)
 - [Pyle stop](#)
 - [Ratio decompression](#)
- [Dive briefing](#)
- [Dive log](#)
- [Dive planning](#)
 - [Scuba gas planning](#)
- [Diver communications](#)
 - [Diving hand signals](#)
 - [Diving line signals](#)
 - [Diver voice communications](#)
- [Diver rescue](#)
- [Diver training](#)
- [Doing It Right](#)
- [Drift diving](#)
- [Gas blending for scuba diving](#)
- [Night diving](#)
- [Solo diving](#)
- [Water safety](#)

[Diving procedures](#)

[Risk management](#)

- [Checklist](#)
- Hazard identification and risk assessment

	<ul style="list-style-type: none"> ○ Hazard analysis ○ Job safety analysis ○ Risk assessment ● Risk control <ul style="list-style-type: none"> ○ Hierarchy of hazard controls ● Incident pit ● Lockout–tagout ● Permit To Work ● Redundancy ● Safety data sheet ● Situation awareness
<p>Diving team</p>	<ul style="list-style-type: none"> ● Bellman ● Chamber operator ● Diver medical technician ● Diver's attendant ● Diving supervisor ● Diving systems technician ● Gas man ● Life support technician ● Stand-by diver
<p>Equipment safety</p>	<ul style="list-style-type: none"> ● Breathing gas quality ● Testing and inspection of diving cylinders <ul style="list-style-type: none"> ○ Hydrostatic test ○ Sustained load cracking ● Diving regulator <ul style="list-style-type: none"> ○ Breathing performance of regulators
<p>Occupational safety and health</p>	<ul style="list-style-type: none"> ● Approaches to safety <ul style="list-style-type: none"> ○ Job safety analysis ○ Risk assessment ○ Toolbox talk ○ Housekeeping ● Association of Diving Contractors International ● Code of practice ● Contingency plan ● Diving regulations ● Emergency procedure ● Emergency response plan ● Evacuation plan ● Hazardous Materials Identification System ● Hierarchy of hazard controls <ul style="list-style-type: none"> ○ Administrative controls ○ Engineering controls ○ Hazard elimination ○ Hazard substitution ○ Personal protective equipment ● International Marine Contractors Association ● Occupational hazard <ul style="list-style-type: none"> ○ Biological hazard ○ Chemical hazard

Incidents**Dive boat incidents****Diver rescues****Early diving****Freediving fatalities****Offshore diving incidents****Professional diving fatalities**

- [Physical hazard](#)
- [Psychosocial hazard](#)
- [Occupational hygiene](#)
 - [Exposure assessment](#)
 - [Occupational exposure limit](#)
 - [Workplace health surveillance](#)
- [Safety culture](#)
 - [Code of practice](#)
 - [Diving safety officer](#)
 - [Diving superintendent](#)
 - [Health and safety representative](#)
 - [Operations manual](#)
 - [Safety meeting](#)
- [Standard operating procedure](#)

- [Sinking of MV Conception](#)

- [Alpazat cave rescue](#)
- [Tham Luang cave rescue](#)

- [John Day \(carpenter\)](#)
- [Charles Spalding](#)
- [Ebenezer Watson](#)

- [Loïc Leferme](#)
- [Audrey Mestre](#)
- [Nicholas Mevoli](#)
- [Natalia Molchanova](#)

- [Byford Dolphin diving bell accident](#)
- [Drill Master diving accident](#)
- [Star Canopus diving accident](#)
- [Stena Seaspread diving accident](#)
- [Venture One diving accident](#)
- [Waage Drill II diving accident](#)
- [Wildrake diving accident](#)

- [Roger Baldwin](#)
- [John Bennett](#)
- [Victor F. Guiel Jr.](#)
- [Craig M. Hoffman](#)
- [Peter Henry Michael Holmes](#)
- [Johnson Sea Link accident](#)
 - [Edwin Clayton Link](#)
- [Gerard Anthony Prangley](#)
- [Pier Skipness](#)
- [Robert John Smyth](#)
- [Albert D. Stover](#)
- [Richard A. Walker](#)

Scuba diving fatalities

- [Lothar Michael Ward](#)
- [Joachim Wendler](#)
- [Bradley Westell](#)
- [Arne Zetterström](#)

- [Ricardo Armbruster](#)
- [Allan Bridge](#)
- [David Bright](#)
- [Berry L. Cannon](#)
- [Cotton Coulson](#)
- [Cláudio Coutinho](#)
- [E. Yale Dawson](#)
- [Deon Dreyer](#)
- [Milan Dufek](#)
- [Sheck Exley](#)
- [Maurice Fargues](#)
- [Guy Garman](#)
- [Steve Irwin](#)
- [Jim Jones](#)
- [Henry Way Kendall](#)
- [Artur Kozłowski](#)
- [Chris and Chrissy Rouse](#)
- [Kirsty MacColl](#)
- [Agnes Milowka](#)
- [François de Roubaix](#)
- [Dave Shaw](#)
- [Wesley C. Skiles](#)
- [Dewey Smith](#)
- [Rob Stewart](#)
- [Esbjörn Svensson](#)
- [Josef Velek](#)

Diving medicine

Diving disorders

- [List of signs and symptoms of diving disorders](#)
- [Cramp](#)
- [Motion sickness](#)
- [Surfer's ear](#)

Pressure related

- [Alternobaric vertigo](#)
- [Barostriction](#)
- [Barotrauma](#)
 - [Air embolism](#)
 - [Aerosinusitis](#)
 - [Barodontalgia](#)
 - [Dental barotrauma](#)
 - [Pulmonary barotrauma](#)
- [Compression arthralgia](#)
- [Decompression illness](#)
- [Dysbarism](#)

Oxygen

- [Freediving blackout](#)

		<ul style="list-style-type: none"> • Hyperoxia • Hypoxia • Oxygen toxicity
	Inert gases	<ul style="list-style-type: none"> • Avascular necrosis • Decompression sickness <ul style="list-style-type: none"> ◦ Isobaric counterdiffusion ◦ Taravana • Dysbaric osteonecrosis • High-pressure nervous syndrome • Hydrogen narcosis • Nitrogen narcosis
	Carbon dioxide	<ul style="list-style-type: none"> • Hypercapnia • Hypocapnia
	Breathing gas contaminants	<ul style="list-style-type: none"> • Carbon monoxide poisoning
	Immersion related	<ul style="list-style-type: none"> • Asphyxia • Drowning • Hypothermia • Immersion diuresis • Instinctive drowning response • Laryngospasm • Salt water aspiration syndrome • Swimming-induced pulmonary edema
Treatment		<ul style="list-style-type: none"> • Demand valve oxygen therapy • First aid • Hyperbaric medicine • Hyperbaric treatment schedules • In-water recompression • Oxygen therapy • Therapeutic recompression
Personnel		<ul style="list-style-type: none"> • Diving Medical Examiner • Diving Medical Practitioner • Diving Medical Technician • Hyperbaric nursing
Screening		<ul style="list-style-type: none"> • Atrial septal defect • Effects of drugs on fitness to dive • Fitness to dive • Psychological fitness to dive
Research in diving	Researchers	<ul style="list-style-type: none"> • Arthur J. Bachrach • Albert R. Behnke

physiology and medicine

- [Paul Bert](#)
- [George F. Bond](#)
- [Robert Boyle](#)
- [Albert A. Bühlmann](#)
- [John R. Clarke](#)
- [Guybon Chesney Castell Damant](#)
- [Kenneth William Donald](#)
- [William Paul Fife](#)
- [John Scott Haldane](#)
- [Robert William Hamilton Jr.](#)
- [Leonard Erskine Hill](#)
- [Brian Andrew Hills](#)
- [Felix Hoppe-Seyler](#)
- [Christian J. Lambertsen](#)
- [Simon Mitchell](#)
- [Charles Momsen](#)
- [John Rawlins R.N.](#)
- [Charles Wesley Shilling](#)
- [Edward D. Thalmann](#)
- [Jacques Triger](#)

Diving medical research organisations

- [Aerospace Medical Association](#)
- [Divers Alert Network \(DAN\)](#)
- [Diving Diseases Research Centre \(DDRC\)](#)
- [Diving Medical Advisory Council \(DMAC\)](#)
- [European Diving Technology Committee \(EDTC\)](#)
- [European Underwater and Baromedical Society \(EUBS\)](#)
- [National Board of Diving and Hyperbaric Medical Technology](#)
- [Naval Submarine Medical Research Laboratory](#)
- [Royal Australian Navy School of Underwater Medicine](#)
- [Rubicon Foundation](#)
- [South Pacific Underwater Medicine Society \(SPUMS\)](#)
- [Southern African Underwater and Hyperbaric Medical Association \(SAUHMA\)](#)
- [Undersea and Hyperbaric Medical Society \(UHMS\)](#)
- [United States Navy Experimental Diving Unit \(NEDU\)](#)

Law

- [Civil liability in recreational diving](#)
- [Diving regulations](#)
- [Duty of care](#)
- [List of legislation regulating underwater diving](#)
- [Investigation of diving accidents](#)

History of underwater diving

- [Aqua-Lung](#)
- [RV Calypso](#)
- [SP-350 Denise](#)
- [History of decompression research and development](#)
- [History of scuba diving](#)
- [List of researchers in underwater diving](#)

- [Porpoise regulator](#)
- [Standard diving dress](#)
- [Timeline of diving technology](#)
- [Underwater diving in popular culture](#)
- [Vintage scuba](#)

Engineers and inventors

- [William Beebe](#)
- [Georges Beuchat](#)
- [John R. Clarke](#)
- [Jacques Cousteau](#)
- [Charles Anthony Deane](#)
- [John Deane](#)
- [Ted Eldred](#)
- [Henry Fleuss](#)
- [Émile Gagnan](#)
- [Joseph-Martin Cabirol](#)
- [Christian J. Lambertsen](#)
- [Yves Le Prieur](#)
- [John Lethbridge](#)
- [Ernest William Moir](#)
- [Joseph Salim Peress](#)
- [Auguste Piccard](#)
- [Willard Franklyn Searle](#)
- [Augustus Siebe](#)
- [Jacques Triger](#)

Publications

Manuals

- [*NOAA Diving Manual*](#)
- [*U.S. Navy Diving Manual*](#)
- [*Basic Cave Diving: A Blueprint for Survival*](#)

Standards and Codes of Practice

- [Code of Practice for Scientific Diving_\(UNESCO\)](#)
- [DIN 7876](#)
- [IMCA Code of Practice for Offshore Diving](#)
- [ISO 24801 Recreational diving services — Requirements for the training of recreational scuba divers](#)

General non-fiction

- [*The Darkness Beckons*](#)
- [*Goldfinder*](#)
- [*The Last Dive*](#)
- [*Shadow Divers*](#)
- [*The Silent World: A Story of Undersea Discovery and Adventure*](#)

Training and registration

[Diver training](#)

- Competence and assessment
 - [Competency-based learning](#)
 - [Refresher training](#)
 - [Skill assessment](#)
- [Diver training standard](#)

<u>Recreational scuba certification levels</u>	Skills	<ul style="list-style-type: none"> • Diving instructor • Diving school • Occupational diver training <ul style="list-style-type: none"> ◦ Commercial diver training ◦ Military diver training ◦ Public safety diver training ◦ Scientific diver training • Recreational diver training <ul style="list-style-type: none"> ◦ Introductory diving • Teaching method <ul style="list-style-type: none"> ◦ Muscle memory ◦ Overlearning ◦ Stress exposure training
		<ul style="list-style-type: none"> • Combat sidestroke • Diver navigation • Diver trim • Ear clearing <ul style="list-style-type: none"> ◦ Frenzel maneuver ◦ Valsalva maneuver • Finning techniques • Scuba skills <ul style="list-style-type: none"> ◦ Buddy breathing ◦ Low impact diving <ul style="list-style-type: none"> ▪ Diamond Reef System • Surface-supplied diving skills • Underwater searches
	Core diving skills	<ul style="list-style-type: none"> • Advanced Open Water Diver • Autonomous diver • CMAS* scuba diver • CMAS** scuba diver • Introductory diving • Low Impact Diver • Master Scuba Diver • Open Water Diver • Supervised diver
	Leadership skills	<ul style="list-style-type: none"> • Dive leader <ul style="list-style-type: none"> ◦ Divemaster • Diving instructor <ul style="list-style-type: none"> ◦ Master Instructor
	Specialist skills	<ul style="list-style-type: none"> • Rescue Diver • Solo diver
Organisations		<ul style="list-style-type: none"> • European Underwater Federation (EUF) • International Diving Regulators and Certifiers Forum (IDRCF) • International Diving Schools Association (IDSA) • International Marine Contractors Association (IMCA)

	<ul style="list-style-type: none"> • List of diver certification organizations • National Oceanic and Atmospheric Administration (NOAA) • Nautical Archaeology Society • Universal Referral Program • World Recreational Scuba Training Council (WRSTC)
Commercial diver certification authorities	<ul style="list-style-type: none"> • Australian Diver Accreditation Scheme (ADAS) • Commercial diver registration in South Africa • Divers Institute of Technology • Health and Safety Executive (HSE) • Department of Employment and Labour
Commercial diving schools	<ul style="list-style-type: none"> • Divers Academy International • Norwegian diver school
Free-diving certification agencies	<ul style="list-style-type: none"> • AIDA International (AIDA) • Confédération Mondiale des Activités Subaquatiques (CMAS) • Performance Freediving International (PI) • Scuba Schools International (SSI)
Recreational scuba certification agencies	<ul style="list-style-type: none"> • American Canadian Underwater Certifications (ACUC) • American Nitrox Divers International (ANDI) • Association nationale des moniteurs de plongée (ANMP) • British Sub-Aqua Club (BSAC) • Comhairle Fo-Thuinn (CFT) • Confédération Mondiale des Activités Subaquatiques (CMAS) • Federación Española de Actividades Subacuáticas (FEDAS) • Fédération Française d'Études et de Sports Sous-Marins (FFESSM) • Federazione Italiana Attività Subacquee (FIAS) • Global Underwater Explorers (GUE) • International Association for Handicapped Divers (IAHD) • International Association of Nitrox and Technical Divers (IANTD) • International Diving Educators Association (IDEA) • Israeli Diving Federation (TIDF) • National Academy of Scuba Educators (NASE) • National Association of Underwater Instructors (NAUI) • Nederlandse Onderwatersport Bond (NOB) • Professional Association of Diving Instructors (PADI) • Professional Diving Instructors Corporation (PDIC) • Sub-Aqua Association (SAA) • Scuba Diving International (SDI) • Scuba Educators International (SEI) • Scottish Sub Aqua Club (ScotSAC) • Scuba Schools International (SSI) • Türkiye Sualtı Sporları Federasyonu (TSSF) • United Diving Instructors (UDI) • YMCA SCUBA Program
Scientific diver	<ul style="list-style-type: none"> • American Academy of Underwater Sciences (AAUS) • CMAS Scientific Committee

**certification
authorities****Technical
certification
agencies****Cave
diving**

- [American Nitrox Divers International](#) (ANDI)
- [British Sub-Aqua Club](#) (BSAC)
- [Confédération Mondiale des Activités Subaquatiques](#) (CMAS)
- [Diving Science and Technology](#) (DSAT)
- [Federazione Italiana Attività Subacquee](#) (FIAS)
- [International Association of Nitrox and Technical Divers](#) (IANTD)
- [Professional Association of Diving Instructors](#) (PADI)
- [Professional Diving Instructors Corporation](#) (PDIC)
- [Trimix Scuba Association](#) (TSA)
- [Technical Extended Range](#) (TXR)

- [Cave Divers Association of Australia](#) (CDAA)
- [Cave Diving Group](#) (CDG)
- [Global Underwater Explorers](#) (GUE)
- [National Association for Cave Diving](#) (NACD)
- [National Speleological Society#Cave Diving Group](#) (CDG)
- [National Association of Underwater Instructors](#) (NAUI)
- [Technical Diving International](#) (TDI)

Underwater sports**Surface snorkeling**

- [Finswimming](#)

**Snorkeling/breath-
hold**

- [Spearfishing](#)
- [Underwater football](#)
- [Underwater hockey](#)
- [Underwater rugby](#)
- [Underwater target shooting](#)

Breath-hold

- [Aquathlon](#)
- [Apnoea finswimming](#)
- [Freediving](#)
- [Underwater ice hockey](#)

**Open Circuit
Scuba**

- [Immersion finswimming](#)
- [Sport diving](#)
- [Underwater orienteering](#)
- [Underwater photography](#)

Rebreather

- [Underwater photography](#)

**Sports governing
organisations
and federations**

- International
 - [AIDA International](#)
 - [Confédération Mondiale des Activités Subaquatiques](#)
- National
 - [AIDA Hellas](#)

- [Australian Underwater Federation](#)
- [British Freediving Association](#)
- [British Octopush Association](#)
- [British Underwater Sports Association](#)
- [Comhairle Fo-Thuinn](#)
- [Federación Española de Actividades Subacuáticas](#)
- [Fédération Française d'Études et de Sports Sous-Marins](#)
- [South African Underwater Sports Federation](#)
- [Türkiye Sualtı Sporları Federasyonu](#)
- [Underwater Society of America](#)

Underwater divers

Pioneers of diving

- [Eduard Admetlla i Lázaro](#)
- [Aquanaut](#)
- [James F. Cahill](#)
- [Jacques Cousteau](#)
- [Billy Deans](#)
- [Hans Hass](#)
- [Dick Rutkowski](#)
- [Teseo Tesei](#)
- [Arne Zetterström](#)

Underwater scientists and archaeologists

- [Michael Arbuthnot](#)
- [Robert Ballard](#)
- [George Bass](#)
- [Mensun Bound](#)
- [Louis Boutan](#)
- [Hugh Bradner](#)
- [Cathy Church](#)
- [Eugenie Clark](#)
- [James P. Delgado](#)
- [Sylvia Earle](#)
- [John Christopher Fine](#)
- [George R. Fischer](#)
- [Anders Franzén](#)
- [Honor Frost](#)
- [David Gibbins](#)
- [Graham Jessop](#)
- [Robert F. Marx](#)
- [Charles T. Meide](#)
- [Mark M. Newell](#)
- [John Peter Oleson](#)
- [Richard Pyle](#)
- [Margaret Rule](#)
- [Gunter Schöbel](#)
- [Stephanie Schwabe](#)
- [E. Lee Spence](#)
- [Robert Sténuit](#)
- [Peter Throckmorton](#)

Scuba record holders

- [Pascal Bernabé](#)

**Underwater
filmmakers
and presenters**

- [Jim Bowden](#)
- [Mark Ellyatt](#)
- [Sheck Exley](#)
- [Nuno Gomes](#)
- [Claudia Serpieri](#)
- [Krzysztof Starnawski](#)

- [Samir Alhafith](#)
- [David Attenborough](#)
- [Ramón Bravo](#)
- [Jean-Michel Cousteau](#)
- [Richie Kohler](#)
- [Ivan Tors](#)
- [Andrew Wight](#)

**Underwater
photographers**

- [Tamara Benitez](#)
- [Georges Beuchat](#)
- [Adrian Biddle](#)
- [Jonathan Bird](#)
- [Eric Cheng](#)
- [Neville Coleman](#)
- [Jacques Cousteau](#)
- [John D. Craig](#)
- [Ben Cropp](#)
- [Bernard Delemotte](#)
- [David Doubilet](#)
- [John Christopher Fine](#)
- [Dermot FitzGerald](#)
- [Rodney Fox](#)
- [Ric Frazier](#)
- [Stephen Frink](#)
- [Peter Gimbel](#)
- [Monty Halls](#)
- [Hans Hass](#)
- [Henry Way Kendall](#)
- [Rudie Kuiter](#)
- [Joseph B. MacInnis](#)
- [Luis Marden](#)
- [Agnes Milowka](#)
- [Noel Monkman](#)
- [Steve Parish](#)
- [Zale Parry](#)
- [Pierre Petit](#)
- [Leni Riefenstahl](#)
- [Peter Scoones](#)
- [Brian Skerry](#)
- [Wesley C. Skiles](#)
- [E. Lee Spence](#)
- [Philippe Tailliez](#)
- [Ron and Valerie Taylor](#)
- [Albert Tillman](#)
- [John Veltri](#)

Underwater explorers

- [Stan Waterman](#)
- [Michele Westmorland](#)
- [John Ernest Williamson](#)
- [J. Lamar Worzel](#)

- Caves
 - [Graham Balcombe](#)
 - [Sheck Exley](#)
 - [Martyn Farr](#)
 - [Jill Heinerth](#)
 - [Jarrod Jablonski](#)
 - [William Hogarth Main](#)
 - [Tom Mount](#)
 - [Jack Sheppard](#)
 - [Bill Stone](#)
- Reefs
 -
- Wrecks
 - [Leigh Bishop](#)
 - [John Chatterton](#)
 - [Clive Cussler](#)
 - [Bill Nagle](#)
 - [Aristotelis Zervoudis](#)

[Aquanauts](#)

- [Andrew Abercromby](#)
- [Joseph M. Acaba](#)
- [Clayton Anderson](#)
- [Richard R. Arnold](#)
- [Serena Auñón-Chancellor](#)
- [Michael Barratt \(astronaut\)](#)
- [Robert L. Behnken](#)
- [Randolph Bresnik](#)
- [Timothy J. Broderick](#)
- [Justin Brown](#)
- [Berry L. Cannon](#)
- [Scott Carpenter](#)
- [Gregory Chamitoff](#)
- [Steve Chappell](#)
- [Catherine Coleman](#)
- [Robin Cook](#)
- [Craig B. Cooper](#)
- [Fabien Cousteau](#)
- [Philippe Cousteau](#)
- [Timothy Creamer](#)
- [Jonathan Dory](#)
- [Pedro Duque](#)
- [Sylvia Earle](#)
- [Jeanette Epps](#)
- [Sheck Exley](#)
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