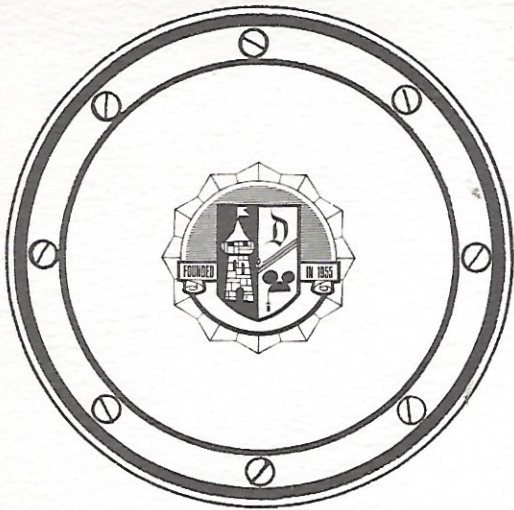


SETTING YOUR COURSE ON THE SUBMARINES

Story Guide and Operations Procedures



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A UNIVERSITY OF DISNEYLAND GUIDE FOR SUBMARINE OPERATORS

Welcome aboard the Disneyland Submarine Voyage.

This attraction is not just a ride on a submarine; it is Walt Disney's re-creation of a living experience and depicts one of America's most dramatic achievements — the nuclear-powered submarine. Our fleet closely parallels its ocean-going counterpart in exterior design.

Duty aboard an atomic-powered submarine has been limited to a select few because of military security, and as a result, the possibility of an American citizen actually submerging in a nuclear submarine is very remote. Here in Disneyland, Walt has made it possible for everyone to experience the events that men of the United States Nuclear Powered Submarine Fleet have been experiencing during the past decade.

To tell you the story behind our submarine fleet and to better familiarize you with the operating procedures of the attraction, we have prepared this manual.

Your foreman and supervisors are on the job to instruct you and to supervise your work. In addition to your accepting training and direction, we would like you to ask questions whenever there is something which is not clear to you.

We hope you enjoy your experience working as part of the crew of the Disneyland Submarine Fleet.

J. W. FOWLER
Vice President for Operations



THE STORY BEHIND THE STORY

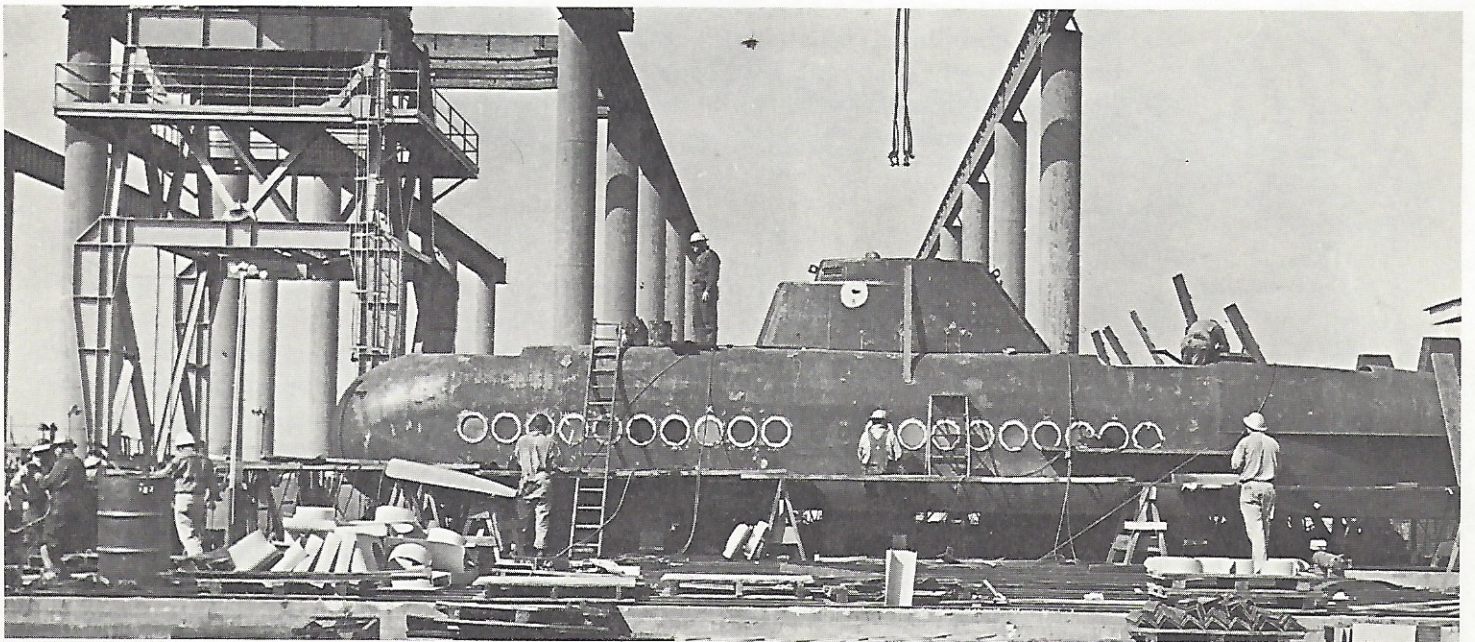
When Disneyland opened its gates on July 17, 1955, Walt said that Disneyland would never be completed. As a result, new attractions were added each year. June of 1959 brought to a climax a \$7.5 million construction program and gave to Disneyland three new attractions; the Monorail, the Matterhorn Bobsleds, and the Submarine Voyage. This major expansion was considered the second opening of Disneyland and premiered before a nationwide television audience estimated at 93 million people.

The first step which led to Disneyland's Submarine Voyage was the filming of Jules Verne's story, "20,000 Leagues Under the Sea." Pre-production planning went on for two years before actual filming was begun. Then, many weeks were spent under the ocean in the brilliantly-hued, air-clear waters of the Bahamas. Other filming was carried on at the

Burbank Studios, and for a period of eight weeks, the 54-man crew worked on an underwater sound stage. "20,000 Leagues Under the Sea" was finally released to the public in December of 1954.

The second step which led to the construction of Disneyland's Submarine Voyage was the commissioning by the United States Navy of the world's first atomic-powered submarine, the U.S.S. Nautilus. Built at a cost of \$55 million, the U.S.S. Nautilus is 320 feet long with a surface displacement of 3,000 tons.

Construction of the Disneyland Submarine Voyage began in the fall of 1958, along with the Monorail and the Matterhorn Bobsleds. The eight submarine hulls were built by the Todd Shipyards of San Pedro at a total cost of \$290,000. The submarines were



then completed at the Disneyland Naval Yard under the direction of their designer, Joseph W. Fowler, Vice President for Operations, and a retired United States Navy Rear Admiral.

Walt Disney is proud of his eight submarines, which comprise the largest peace-time fleet in the

world. Each one is named after a submarine of the United States Navy Nuclear-Powered Submarine Fleet. During the big opening in June of 1959, the Disneyland Fleet was christened by Mrs. Mildred Nelson, a former WAVE and wife of Chief Machinist Mate Stewart N. H. Nelson of the U.S.S. Nautilus.

OUR LIVING SUBMARINE STORY

Each attraction in Disneyland is laid out in a thematic story framework using re-creations of original sights and sounds to give the guest a living experience. We owe it to our guests to make the Submarine Voyage just as realistic and exciting as possible.

The guests' ride experience is broken into distinct segments, each of which has been carefully designed to give them a specific experience or observation.

It is necessary for you to know these thoroughly in order to get the proper feel of your attraction and to properly answer questions.

GETTING UNDER WAY

Taped narrations have been prepared to be used as the guest enters the submarine. This narration is important because it "sets the stage" and makes the guest feel as if he were actually getting ready to submerge in a submarine.

The Captain gives the order to make all preparations for getting under way. The lines are taken in and the ship is rigged for dive. The Captain then gives the order to clear the bridge and secure hatches and vents. At this point, the last guest should be on board, and the dock operators are to raise the ramps and secure the hatches. This may not always be possible due to certain loading conditions, but the submarine navigator should try to time the narration as closely as possible.

As the submarine starts to leave the dock, the Captain should be giving the "all ahead two-thirds."

DIVING AND LAGOON SEGMENT

As the submarine leaves the dock, it dives below the surface to view the under-sea life of a tropical lagoon. The diving effect is accomplished by a dense curtain of small bubbles rushing toward the surface on a slight angle, giving the feeling that the submarine is moving forward and down.

Upon reaching the prescribed level, guests can view the strange inhabitants of this under-sea world hiding among the seaweed, coral reefs, and weird rock formations. Other creatures are lurking in the depths of mysterious caves, favorite hiding places for octopii, king crab, moray eel, and giant clams.

The counterpart of these giant clams live on the coral of the East Indies and Australia. Their shells often weigh over 500 pounds. Coral is a limestone formation formed in the sea by millions of tiny animals. The living coral-forming animals color the formations in beautiful shades of tan, orange, yellow, purple, and green. When the animals die, they leave limestone skeletons that form the foundations of barriers in the sea called coral reefs. When coral is removed from the water, its color fades to a dull white. So, in order to restore the natural beauty of the coral for the submarine lagoon, it is painted to match its original color.

GRAVEYARD OF LOST SHIPS SEGMENT

After a quiet cruise through the lagoon, the navigation room receives word of a surface storm ahead. The submarine begins a dive, which takes it to 250 feet, a point safely below the violence of the turbulent hurricane. (At this point, the submarine enters the caverns.)

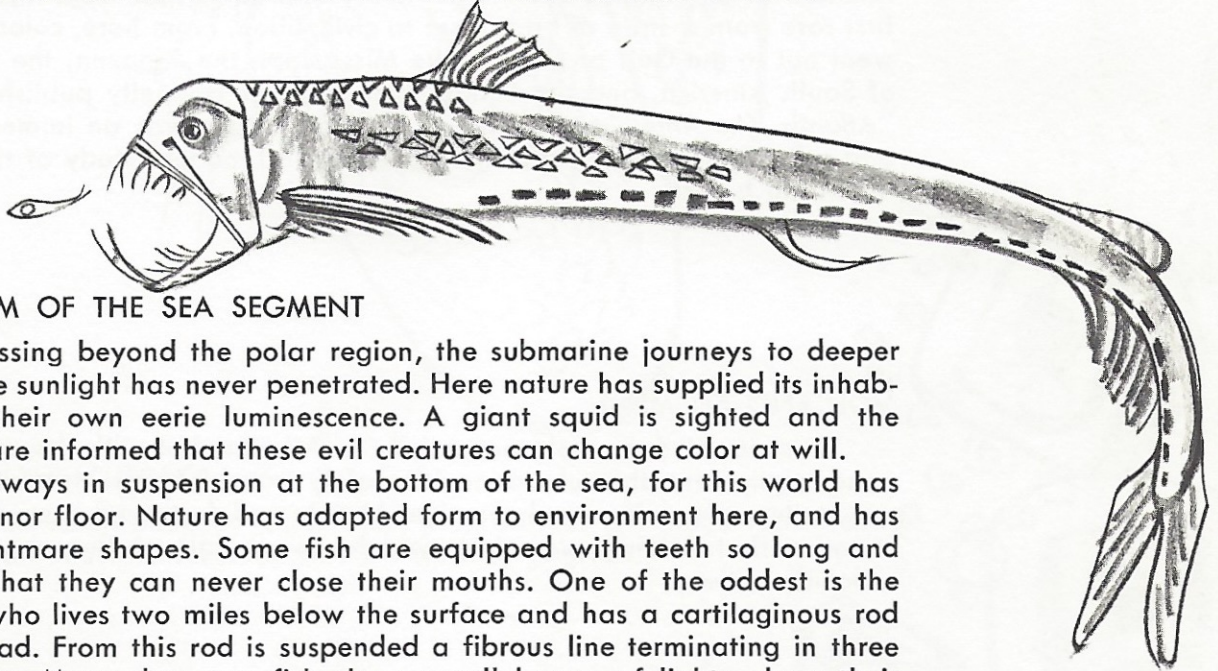
Other ships have not been fortunate enough to be able to dive below the surface, and the submarine passes through the evidence of their fate, the graveyard of lost ships.

This area is a grim reminder to modern mariners of the hazards that lie below. Ships from many periods of history lie barnacle-covered and decayed as only the sea can age them. The once-proud Greek and Roman vessels lie along side the majestic Viking ships with their distinctively carved figureheads. An octopus guards a treasure chest in a hold of a Venetian galley. Nearby, deep-sea divers work to carry other treasures to the surface.

NORTH POLE SEGMENT

Sonar detects the polar ice cap ahead of the submarine, and the diving officer takes the ship deeper in order to clear the ice. A countdown commences, and the exact spot of the North Pole is marked.

This is a re-creation of the historic voyage of the U.S.S. Nautilus when it left Hawaii on July 22, 1958 and set its course for the North Pole. On August 3, 1958 at 11:15 p.m. Eastern Daylight Savings Time, Commander William R. Anderson informed the crew of the Nautilus that the North Pole had been reached.

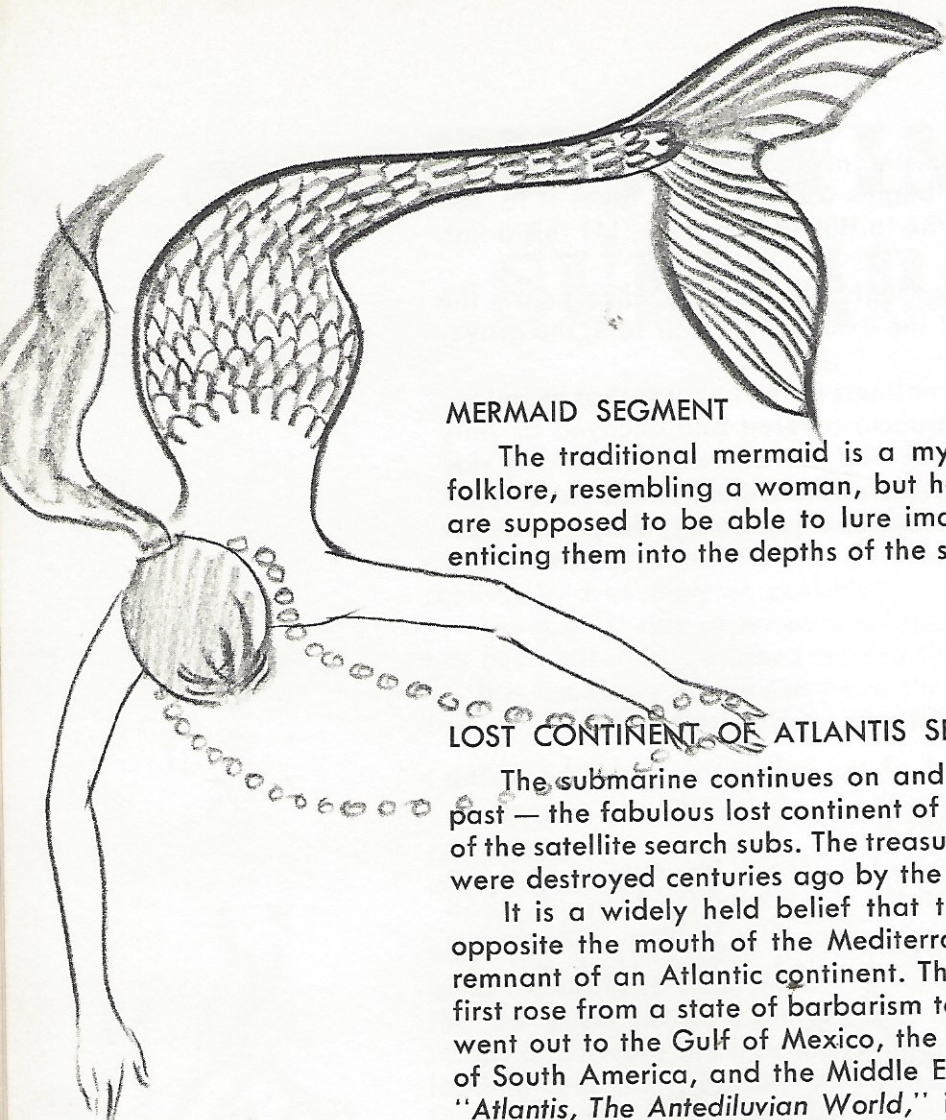


THE BOTTOM OF THE SEA SEGMENT

After passing beyond the polar region, the submarine journeys to deeper waters where sunlight has never penetrated. Here nature has supplied its inhabitants with their own eerie luminescence. A giant squid is sighted and the passengers are informed that these evil creatures can change color at will.

Life is always in suspension at the bottom of the sea, for this world has neither roof nor floor. Nature has adapted form to environment here, and has evolved nightmare shapes. Some fish are equipped with teeth so long and needle-like that they can never close their mouths. One of the oddest is the angler fish who lives two miles below the surface and has a cartilaginous rod above its head. From this rod is suspended a fibrous line terminating in three barbed hooks. Many deep sea fish show parallel rows of lights along their bodies, and others suspend tiny bulbs on long streamers. These may vary in color, for even though bioluminescence is usually a ghastly white, it may range through red, yellow, green, blue, purple, and even violet.

The giant squid (ARCHIT EUTHIS PRINCEPS) lives below the 600-foot mark, and grows to lengths in excess of 50 feet. Giant squid have often been mistaken for sea serpents. Such reports have persisted for centuries, but of course they have no basis in fact. Tall tales of ocean monsters should be classed as fiction along with the myth of mermaids.



MERMAID SEGMENT

The traditional mermaid is a mythical sea-dwelling creature of European folklore, resembling a woman, but having a fishtail instead of legs. Mermaids are supposed to be able to lure imaginative, amorous men to destruction by enticing them into the depths of the sea.

LOST CONTINENT OF ATLANTIS SEGMENT

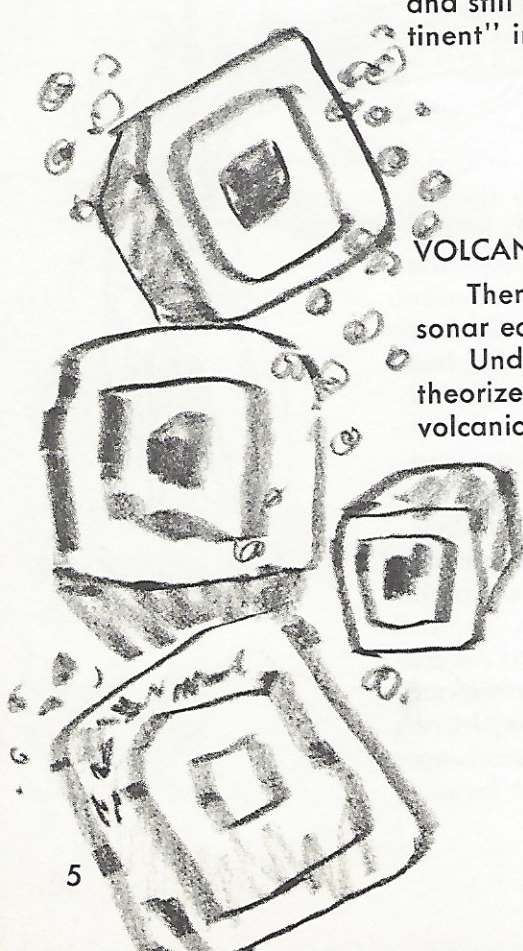
The submarine continues on and soon enters an area given to the distant past — the fabulous lost continent of Atlantis. It was discovered recently by one of the satellite search subs. The treasures and grandeur of this ancient civilization were destroyed centuries ago by the eruption of a gigantic volcano.

It is a widely held belief that there once existed in the Atlantic Ocean, opposite the mouth of the Mediterranean Sea, a large island which was the remnant of an Atlantic continent. Theory maintains that from this island, man first rose from a state of barbarism to civilization. From here, colonizing parties went out to the Gulf of Mexico, the Mississippi, the Amazon, the Pacific Coast of South America, and the Middle East. Ignatius Donnelly published his book, "*Atlantis, The Antediluvian World,*" in 1882, which was an immediate success and still stands as the cornerstone on which all modern study of the "lost continent" is based.

VOLCANO SEGMENT

There is still some volcanic activity in Atlantis, but with the use of modern sonar equipment, the submarine can safely travel between tottering columns.

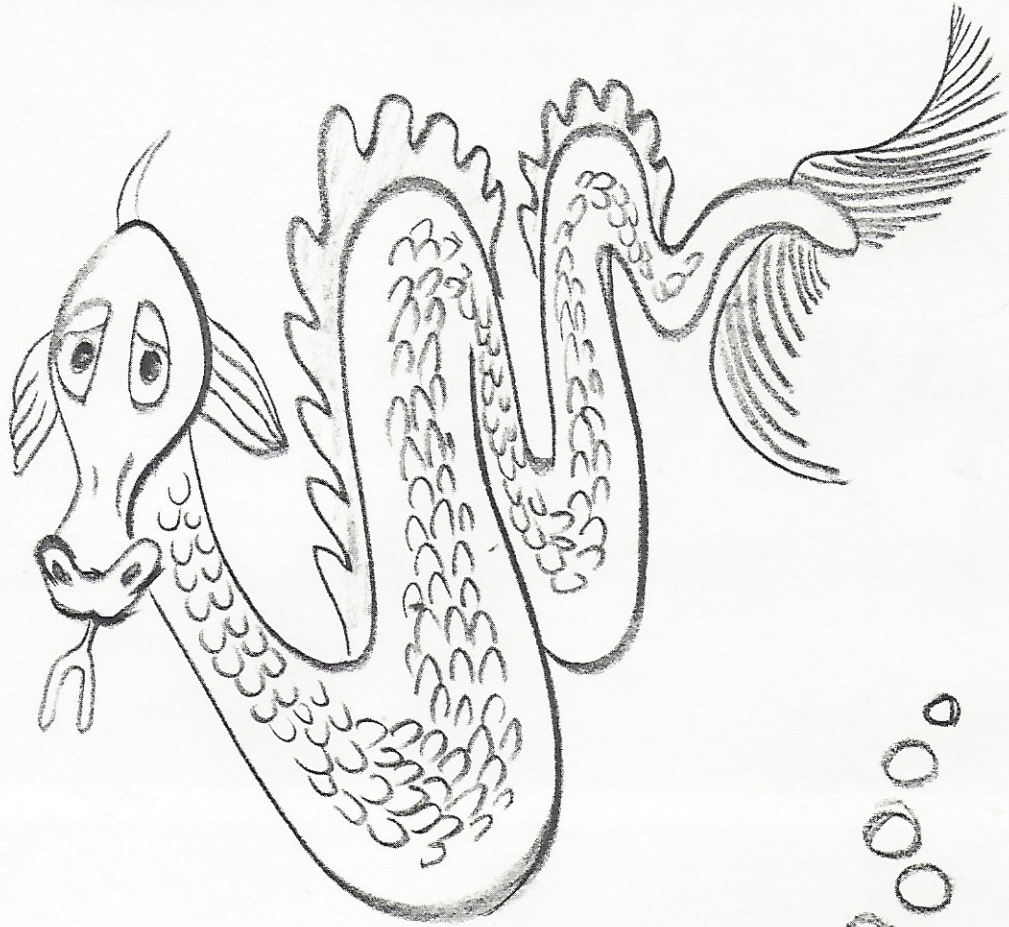
Underwater volcanoes have given birth to and destroyed many islands. Some theorize that Atlantis was destroyed by a gigantic earthquake followed by volcanic action.



SEA SERPENT SEGMENT

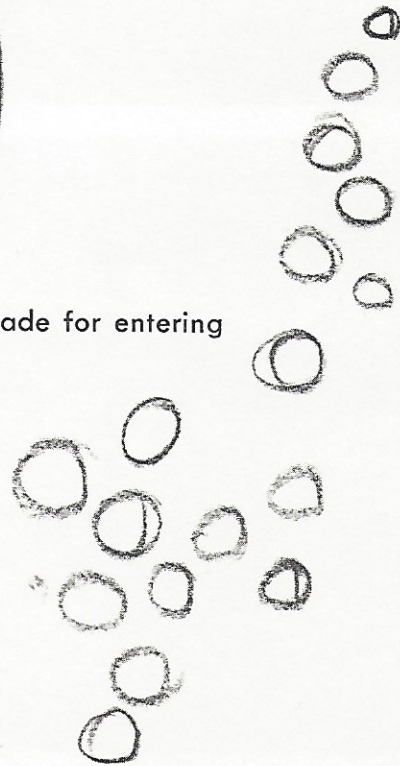
As the submarine safely leaves the area of volcanic disturbance, a sea serpent is sighted. The Captain calls the crew to man their battle stations and stand by for action. He then becomes convinced that he has been at sea too long when the comical cross-eyed laughing sea serpent appears. (At this point, the submarine exits from the caverns.)

No creature has ever stirred the imagination of mankind more than the sea serpent. Written records dating back to 488 A.D. in China mention a marine monster 300 feet long, black in color, and without scales, swimming in the Chien Tany River. The sea serpent was especially popular in Norse literature and folklore, dating from a very early period and continuing almost to the present time.

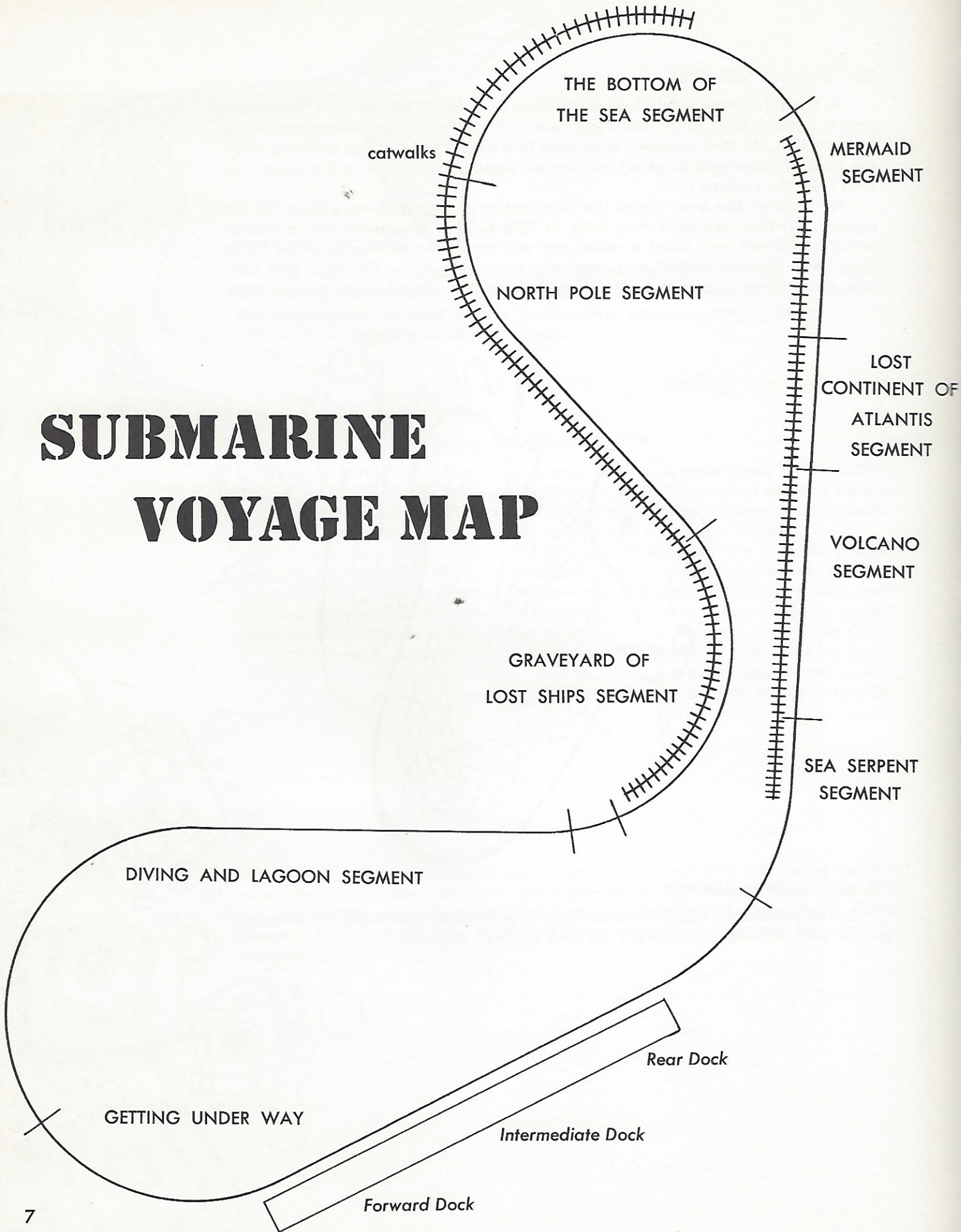


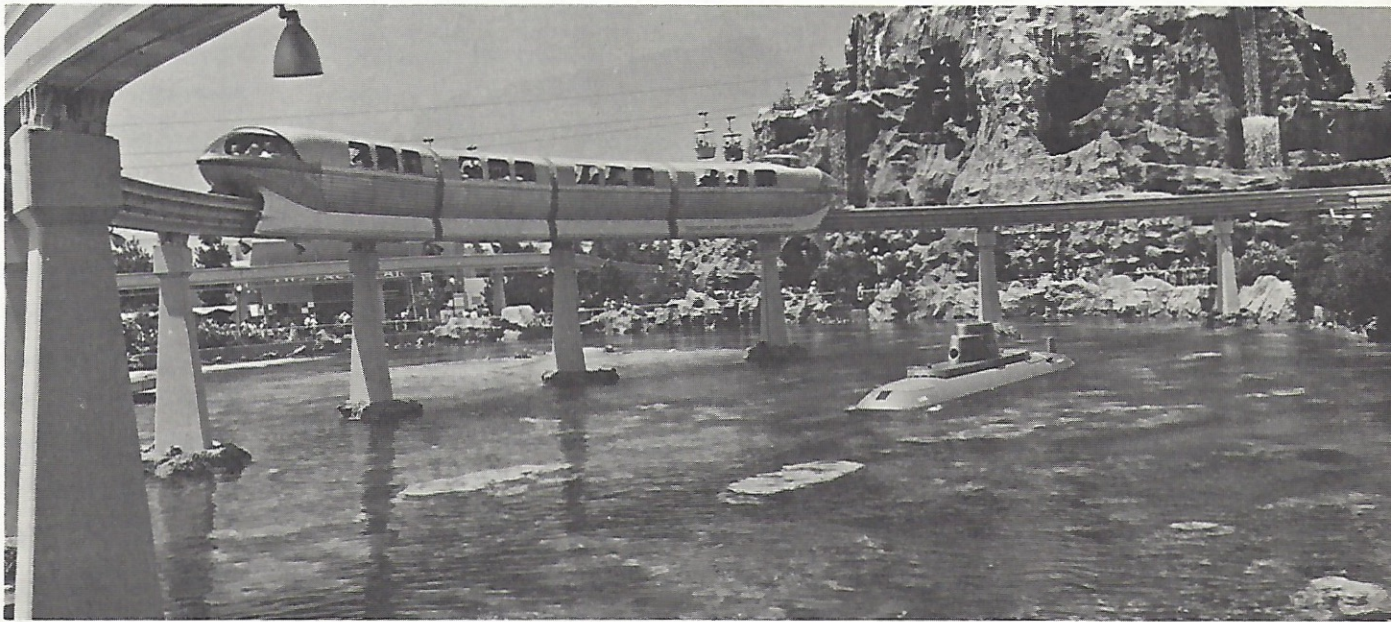
RETURN TO THE SURFACE

As the submarine reaches the surface, preparations are made for entering port. When all lines are secured, the "All ashore" is given.



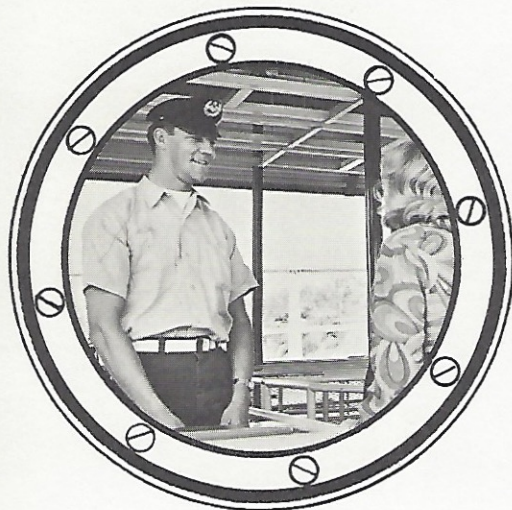
SUBMARINE VOYAGE MAP



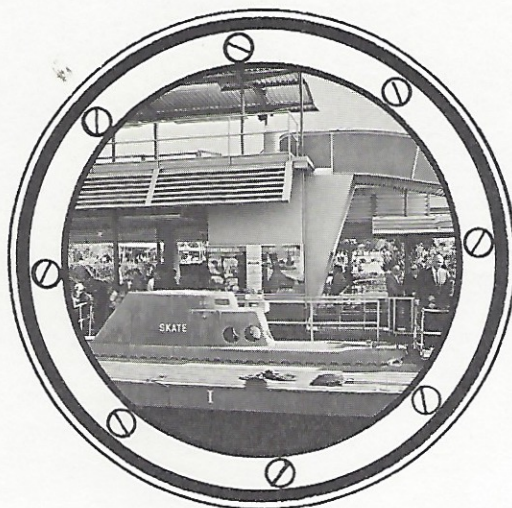


OPERATING PROCEDURE

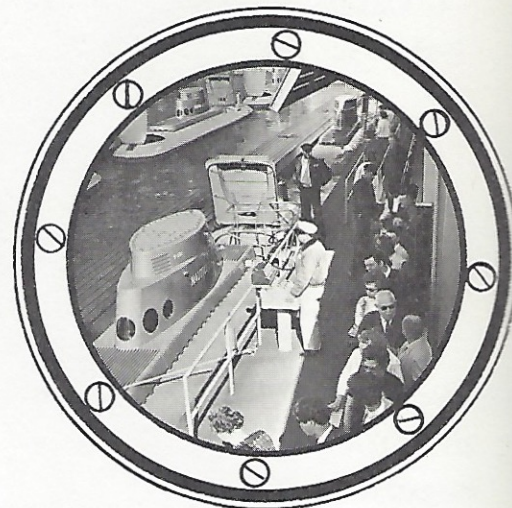
TICKET RECEPTIONIST



FORWARD DOCK



GROUPEUR



The Submarine Voyage is an attraction where rigid adherence to operating procedures must be followed to provide a safe voyage for our guests.

In this section of the handbook, we outline the procedures on our Submarine Voyage which must be followed at all times. This can be done only if you thoroughly understand the procedures and the reasons for them.

DOCK POSITIONS

Ticket Reception

The operator at the turnstile is the official host for the Submarine Voyage, and it is his responsibility to take the guests' tickets. He must thoroughly understand all ticket media and regulate the audience flow into the waiting area. It is also his responsibility to:

1. Take the hourly count when assigned to do so.
2. Inform guests with crutches that they must be able to board the submarine with-

out the use of their crutches.

The turnstile operator must always be pleasant. There will be times when this position is extremely busy, but each guest must be given the complete attention that he or she deserves.

Audience Waiting Area

The audience control position will inform guests as to which coupon to use and maintain equal length in both lines. When the lines extend beyond the turnstile, inform the guests they are entering the Submarine Voyage. The monorail and submarine lines are easily confused on busy days.

Forward Dock

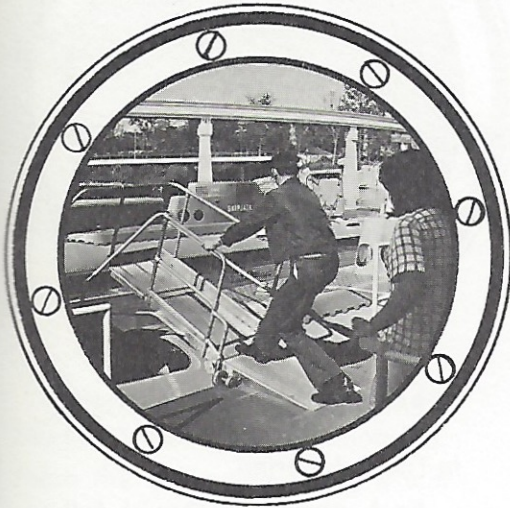
The Forward Dock has three positions; the Grouper, Rear Hatch, and Front Hatch.

The grouper is responsible for panel, radio, and telephone communications. He will arrange the guests into two groups of 19. The first 19 will enter the front hatch and the next 19 will enter the rear

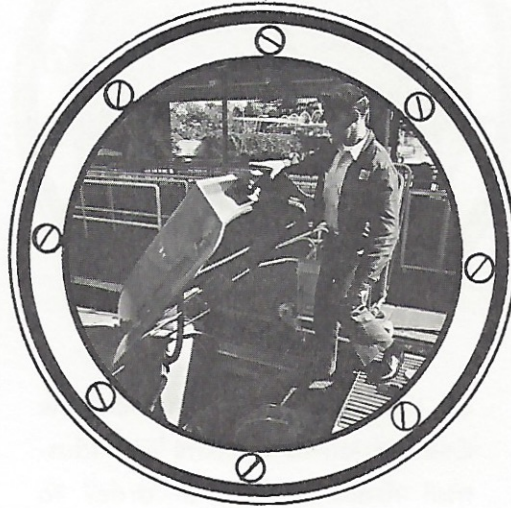
hatch. He will ask parents to hold small children on their laps. When the intermediate dock signals for a "double load," the grouper will send 38 guests to the intermediate dock in lines of 19 each. During an eight-boat operation, every other submarine loaded at the front dock will require a double load to be sent to the intermediate dock.

The forward hatch position. As the submarine approaches the front dock to take on guests, the bow line is placed on the submarine, the hatch is raised, and when the submarine has stopped, the ramp may be lowered. As the guests board, hold the hatch, ask them to watch their step and hold small children by the hand. Assist elderly guests and small children. The operator should count the number of guests entering, double-checking the grouper. After the last guest has entered the submarine, raise the front

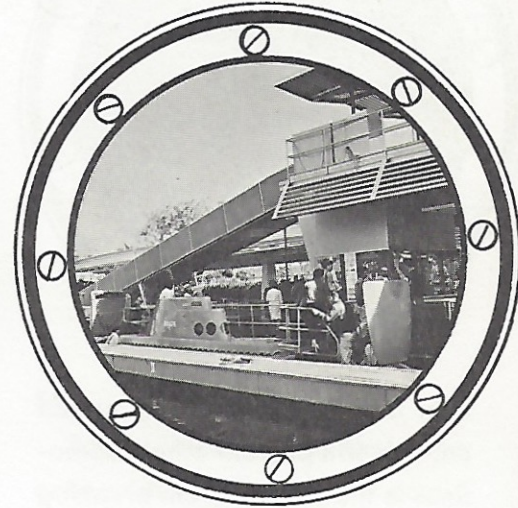
FORWARD HATCH POSITION



REAR HATCH POSITION



INTERMEDIATE DOCK UNLOADING



ramp, close the hatch, checking to see if it is closed. When the rear ramp has been raised, the bow line may be removed and the "GO" signal given. **DO NOT GIVE THE "GO" SIGNAL UNTIL BOTH RAMPS HAVE BEEN RAISED.**

The rear hatch position. As the guests board, hold the rear hatch and ask them to watch their step and hold small children by the hand. Assist elderly guests and small children. The operator should count the number of guests, double-checking the grouper. After the last guest has entered the submarine, raise the ramp, close the hatch, and check to see if it is secure. When a grouper is not available, the rear hatch position will also assume the duties of the grouper.

Intermediate Dock

The function of the intermediate dock is two-fold. One is loading, the other is unloading.

Loading. As the submarine approaches the intermediate dock, the bow line is placed on the submarine, and the front hatch is raised. When the sub stops, the ramps may be lowered. The loading procedure is the same as the forward dock position. After securing the hatch, remove the bow line. One of two signals will be given while standing on the front hatch.

1. The "FUDGE" signal is given when the bow line is on the sub at the forward dock. This will move the intermediate boat forward about 12 feet.
2. The "GO" signal may be given when the submarine at the forward dock starts to move. The operator must stay on the sub until the "GO" signal is given.

DO NOT GIVE ANY SIGNAL UNTIL BOTH RAMPS HAVE BEEN RAISED.

Unloading. As the submarine approaches the dock, place the bow line on the bit, raise the front hatch, and after the submarine stops, lower both ramps. Ask the guests to watch their step, help small children and elderly guests up the ladder. As the guests disembark, be sure to hold onto the hatch. After both ramps have been raised, the bow line is removed and the "FUDGE" or "GO" signal is given by the forward hatch operator.

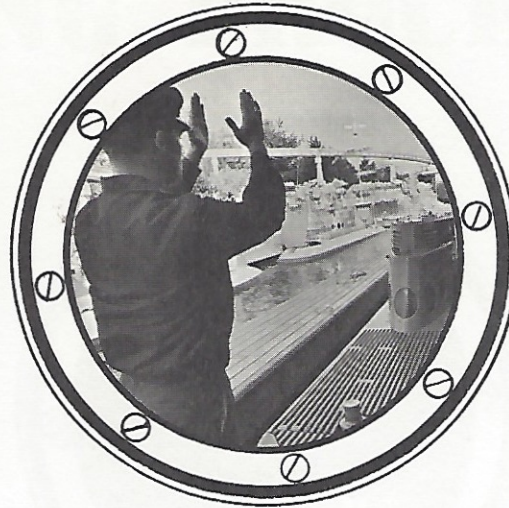
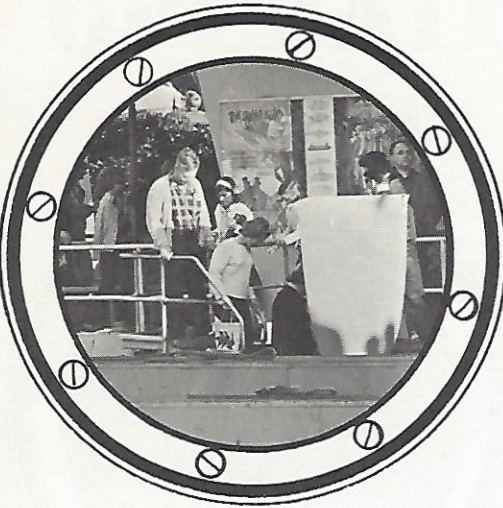
Rear Dock

The function of the rear dock is to unload submarines. The unloading procedure is the same as the intermediate dock. The responsibilities of the rear hatch position are to give proper docking signals to incoming submarines and control the red light located behind the exit falls. When a ship is occupying the rear dock position and a submarine breaks the waterfalls, the red

INTERMEDIATE DOCK LOADING

"FUDGE" SIGNAL

"GO" SIGNAL



light is to be immediately turned on. This will prevent other submarines in the caverns from breaking the exit falls. The submarine that broke the falls will occupy the lagoon area located between the rear dock and the falls. This light may be turned off as the submarine in the lagoon enters the rear dock position. As the submarine enters the dock, give the proper signal as to which dock to unload (Intermediate or Rear).

SUBMARINE SKIPPER

When operating a submarine, maintain the proper speed as indicated on the amperage card located in the sail. Be alert and observe red and green lights at the entrance falls, dry dock switch, and at the exit falls. If at any time a submarine stops inside or outside the caverns, the manual breakdown light should be turned on. This includes emergency stops in the dock area. For normal docking, the manual light is not used.

THE USE OF THE RADIO

Disneyland has been licensed

by the Federal Communications Commission to operate an industrial radio station. In order to maintain this privilege, various rules regarding the use of the two-way radio must be followed. The F.C.C. monitoring station may at any time listen to any radio communication originating at Disneyland.

1. Superfluous transmissions are strictly prohibited.
2. The use of profane or obscene language while transmitting is strictly prohibited.
3. False or deceptive signals are strictly prohibited.
4. Malicious interference, or a deliberate attempt to "jam" another unit is strictly prohibited.
5. Interference with distress signals is strictly prohibited. If you hear someone in trouble, stay off the air, unless you are in a position to be of assistance.

At the end of each message, submarine control will clear the station by saying, "KC7032 clear."

EMERGENCY PROCEDURES

In The Submarine

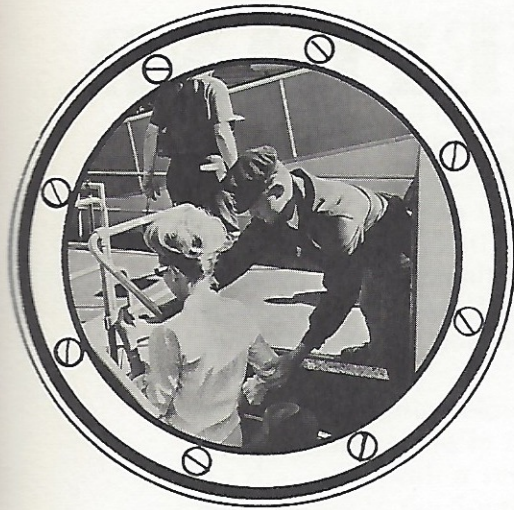
Each navigator should follow the same emergency and breakdown procedure. In all cases, radio submarine control and inform them as to the problem and your position. Submarine control will advise all units to hold their positions. (Remember, when you stop, turn on your manual breakdown light.) By the information received, submarine control will handle the breakdown or emergency.

At The Panel

In the event of a mechanical malfunction of the submarine while working the panel, radio all submarines and have them hold their positions. After submarine control has the exact location of the stalled unit, have all units in front of the one not functioning finish their trips. Make a note of the time of the breakdown and call:

- Dry Dock
- Operations
- Construction and Maintenance
- Central Ticket Booth #9

ASSISTING A GUEST

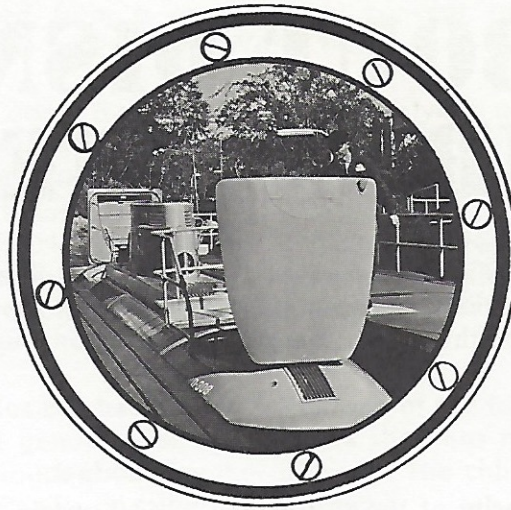


The stalled submarine will be towed to the dock and unloaded. From the unloading dock, it will be towed to one of the storage rails. If necessary, the foreman or supervisor will issue readmission tickets. When the attraction resumes normal operation, call the emergency numbers and inform the proper persons that the submarines have resumed normal operation.

Power Failure

Emergency battery power will automatically take over in the event of a power failure (engine). This will supply power for the radio, cabin lights, and emergency breakdown light. Notify the guests as to the loss of power. Inform them the voyage will resume momentarily. Radio submarine control and inform them of the problem. Submarine control, in turn, will call the dry dock and inform the diesel mechanic of the problem and the unit's location. Operations, Construction and Maintenance and Central Ticket Booth #9 should be called.

REAR DOCK



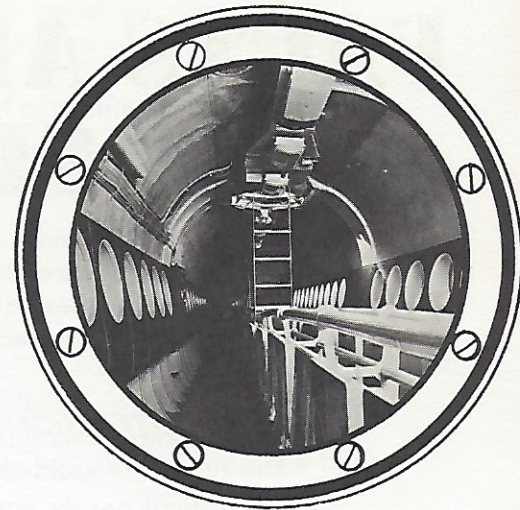
Broken Porthole

A broken porthole is handled in the same manner. Radio submarine control. They will call the dry dock, and dry dock will dispatch a breakdown crew and divers to plug the hole. Each submarine has a cushion in the conning tower that should be used to plug the broken porthole from inside the submarine. Guests will be escorted out of the caverns via the catwalks and the emergency exits. A skiff will be dispatched to unload guests in the lagoon area.

Claustrophobia

Close quarters aboard the submarine may result in a person experiencing claustrophobia. Radio submarine control and briefly explain the problem. Procedure to follow depends on how the guest feels. Turning on the cabin lights may help. As a last resort, open the hatch and allow the guest to sit on the steps. Submarine control will either dispatch the skiff or a crew to assist the guest out via the emergency exits.

SUBMARINE INTERIOR



Fire

Each submarine has three fire extinguishers. Two twenty pound CO₂ extinguishers are located in the engine compartment, and a five pound CO₂ extinguisher is located next to the sound box. The extinguishers in the engine compartment will go off automatically if the temperature becomes too high. They also may be activated manually from the engine compartment.

The CO₂ unit check switch located in the sail is an electrical check to see if the engine compartment extinguishers are functioning properly.

Accidents

All injuries must be reported to the foreman so a report can be made. If a guest is unable to move, call First Aid, Extension 247. If the injury is minor, ask the guest if he would like to go to First Aid. If he does, the operator will accompany him. A guest who gets wet while on the attraction should be taken to First Aid and an accident report filed. Employee injuries should be reported to foreman.

FACTS ABOUT DISNEYLAND SUBMARINES

Disneyland guests will ask you many questions about the Submarine Voyage. In order to correctly answer these questions, we have prepared this fact sheet. If you have any questions that are not answered on this sheet, contact your foreman, supervisor, or the University of Disneyland.

ATTRACTION

The length of guide rail	1365 feet
Theoretical hourly capacity of the attraction	1410 guests
Amounts of water in the lagoon and caverns	9,000,000 gallons total
Initial cost of building	\$2.5 million
Filtering system	3,000 gallons per hour
Filtering system motors	two 25 h.p. electric motors
Biggest day (attendance)	July 4, 1965 — 20,976

SUBMARINES

Displacement loaded in fresh water	94,000 pounds
Length	52 feet
Capacity	38 guests
Type of propulsion	Diesel-electric
Specifications of the diesel	M.A.N. diesel, 40 h.p. at 1500 rpm., 4 cylinder
Specifications of the electric motor (the electric motor drives the propeller shaft)	240 V., 10 h.p., 38 amp.
Propeller	4 blade bronze 34" diameter
Speed of the submarine	2.5'/second, or 1.7 mph
Fuel consumption	1.6 gallons/hour
Builders	The hull was built at the Todd Shipyard in San Pedro. Completed at Disneyland under the direction of Joe Fowler.
Cost of each submarine	Approximately \$80,625

A BRIEF HISTORY OF SUBMARINES

The first submarine was a leather-covered rowboat demonstrated in England about 1620 by its builder, Cornelius von Drebbel, a Dutch scientist. In 1776, David Bushnell built the Turtle, a one-man submarine. It made an unsuccessful attack on a British man-of-war in New York harbor—the first recorded attack on a war ship.

Robert Fulton built the Nautilus, a copper-covered submarine 21 feet long, in 1800.

During the Civil War, the Confederate CSA Hunley made the world's first successful attack on a warship. In 1864, it rammed the Federal corvette USS Housatonic in Charleston Harbor. A torpedo on the Hunley's spar exploded, sinking both ships.

John P. Holland won a U.S. Navy contract in the late 1890's to build a submarine. Commissioned the USS Holland in 1900, the Navy's first submarine was 53 feet long, displaced 75 tons, used a gasoline engine on the surface, and an electric motor while submerged, and could attain a speed of seven knots on the surface.

The USS Skipjack was launched in 1911 and crossed the Atlantic in 1917. It greatly increased the range over previous submarines.

Submarines progressed from a revolutionary concept to a practical weapon with the advent of the German U-boats during World War I. They revised the conduct of modern warfare.

World War II brought about a change in submarine styling and convenience aboard ship.

In 1949, the Navy assigned Captain Hyman G. Rickover the job of building a nuclear power plant for submarines. Six years later, the Navy commissioned the first nuclear powered ship, the submarine USS Nautilus.

By the early 1960's, the Navy had nearly 60 nuclear powered submarines built or scheduled for construction. These submarines can travel over 60,000 miles before refueling and can dive deeper and stay submerged longer than older types.

NAUTILUS

Our submarine Nautilus has been named after one of the four living species of deep-sea mollusks which are in the genus called Nautilus. Its shell has many chambers, and is lined on the inside with a substance called mother-of-pearl. The chambered nautilus lives on the ocean floor in the South Pacific and the Indian Ocean.

UNITED STATES NAVY NUCLEAR FLEET

The names of the Disneyland submarines were selected from a list of United States Navy Nuclear powered submarines. Here are some of the accomplishments of these boats.

USS Nautilus

The world's first nuclear powered submarine was commissioned in September, 1954. It was the first to sail under the North Pole, August 3, 1958. The Nautilus is 320 feet long with a surface displacement of 3,000 tons and cost \$55 million.

USS Seawolf

The second nuclear powered submarine, capable of patrolling submerged for several months, set a record by staying submerged for sixty days.

USS Skate

The USS Skate crossed the Atlantic twice, submerged over the entire distance.

USS Skipjack

This submarine was the first to have the new fish-shaped hull, which was patterned after the USS Holland built in 1898. The diving planes are located on the sail. During the N.A.T.O. "war games" carried out through the Mediterranean during the summer of 1959, the USS Skipjack, then America's fastest attack submarine, "sank" every aircraft carrier in the combined fleet in less than six hours.

USS Triton

The Triton was the first submarine to travel around the world submerged. The record breaking trip began February 16, 1960, and took 84 days, covering 41,500 miles. The course closely paralleled that of Ferdinand Magellan, who, in 1519, became the first navigator to circle the earth.

USS George Washington

It carries the polaris ballistic missile, which may be fired while traveling beneath the sea at high speeds. The fish-shaped hull has the diving planes on the sail.

USS Patrick Henry

Fully equipped, it cost approximately \$100 million. Each polaris ballistic missile costs \$1.2 million.

USS Ethan Allen

It is 410 feet in length and 33 feet wide. It has a crew of 110 men and 13 officers, travels at speeds in excess of 30 knots, and can submerge to a depth of more than 400 feet. Submerged, it displaces 7900 tons.

HOW A SUBMARINE OPERATES

On the surface, a submarine behaves much like any other ship. It has a rudder at the stern and can be maneuvered like other surface vessels.

To submerge, the submarine takes water into its ballast tanks by releasing air in the tank. This will produce a condition of neutral buoyancy. The ship will hover below the surface. To submerge more quickly, the negative tank is flooded. When the desired depth is reached, the negative tank is filled with air.

Diving planes, which act like wings, are set to the angle at which the submarine will sink.

Nuclear powered submarines continue to use their normal engines, while conventional submarines switch to their battery driven electric motors. By adjusting the diving planes, the submarine can move up or down in the water.

When surfacing, the diving planes are set and all the water is blown from the ballast tanks. The diving control officer can regulate the speed and angle of the ship's rise by varying the angle of the diving planes, and the pressure used to blow the main ballast tanks.

GLOSSARY

Air Flask — Metal container for storing compressed air.

All Back — Emergency measure taken to halt forward movement of the submarine by putting all available power into reverse.

Ash Cans — Classical term for depth charges.

Aye Aye — Old English for "yes." Probably taken from the Latin verb "ais" — to affirm.

Ballast Tanks — Hollow areas especially designed to hold either water or air, which control the buoyancy of the submarine.

Binnacle List — The names of those under medical care.

Blow Ballast — To force water from the tanks with compressed air.

Bow — The forward or front part of the ship or vessel.

Broach — To surface without intent.

Can — A storage battery.

Captain — Any officer of any rank in command of the ship.

Christmas Tree — The panel of colored lights that indicate conditions in various sections of the boat.

Cigarette Deck — An area topside, usually around a gun mounting, where cigarette smoking is allowed while on the surface.

Conning Tower — Area from where the submarine is navigated while on the surface. Also houses the periscope for observing surface craft while submerged.

Crash Dive — Journalist jargon to indicate going below in a hurry.

Diving Trim — The total volume of the main ballast tanks equals the unsubmerged volume of the submarine above the water line.

Down the Throat — A torpedo shot at the bow of a target ship from directly ahead. Since the target area exposed is very small, this is considered the most difficult fire control problem.

End Around — A maneuver by which a submarine overtakes and passes a target, keeping out of detection range, in order to be in position to fire torpedoes from a position ahead and to one side of the target.

Executive Officer — The second in command of the ship.

Fantail — The curved deck over the stern.

Fathom — From Anglo-Saxon "faehom," Dutch "vadem," Latin "patene"; act of stretching two arms wide as a rough measurement of six feet.

Feather—Visible wake of the periscope on the surface of the sea.

Great Circle Course—The short distance between two points on the earth's surface.

Gyrocompass—A compass in which a revolving wheel is used instead of a magnet.

Hedgehog—A system of firing a number of anti-submarine depth charges in a prescribed pattern.

Knot—A unit of speed, equivalent to one nautical mile (6,080.20 feet) an hour, or $1\frac{1}{8}$ land miles per hour.

Kingston Valve—A valve provided to allow water to run from the bottom of the ballast tanks to the sea.

Lung—The Momsen escape mask used by crews to evacuate from disabled submarines.

Moor—From the Dutch word "marren"; to tie, to fasten.

Negative Tank—This area gives the submarine enough added weight to sink to the desired depth. Used when a fast dive or ascent is needed.

Neutral Buoyancy—A condition where the submarine will neither sink or float. It will hover at the prescribed depth.

Periscope Depth—The depth at which the periscope protrudes from the water while the rest of the boat is submerged.

Ping—The audible signal of active sonar or Asdic.

Pip—The luminous indication of a target image appearing on a radar or P.P.I. scope.

Pistol—The firing mechanism or detonator of a torpedo.

Port—The side of a ship on the left of a person looking from stern to bow.

Sail—Contains the submarine's bridge and navigation room, used both on and under the surface. Smaller than a conning tower.

Secure—It is applied to anything or any situation, particularly if the correct term is not readily available. A post may be secured if it is held. It is also secured if left to itself. It is the "gadget" word of the Navy.

Skipper—Derived from the Scandinavian word "schiffe" meaning ship; or the Dutch word "schipper," which means captain.

Smoking Lamp—A lamp on a ship kept lighted during the hours when smoking is allowed.

Sonobuoy—An electric cylinder that is dropped in the water to pinpoint a submerged submarine. They are usually dropped in a circular pattern so that any two combined with a center buoy will provide the segment of the circle in which the lurking sub lies.

Sound Man—The seaman who works the hydrophone or sound equipment.

Spread—A number of torpedoes fired at the same time but at different angles.

Starboard—The side of a ship on the right of a person looking from stern to bow.

Stern—The rear end or back of a ship or vessel.

Tin Can—A Destroyer.

Tin Fish—A torpedo.

Talker—An enlisted man assigned the duty of repeating messages over the boat's battle telephone circuit.

T.D.C.—Torpedo data computer.

T.B.T.—Target bearing transmitter.

Trim Tanks—Located at each end and side of the ship to help keep the submarine on an even keel.

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