The SPT-16 Submarine

The SPT-16 is the most expensive tourist submarine yet constructed. One look at this vessel and it is obvious even to the neophyte that no expense was spared during its manufacture. The vessel was assembled with Swiss precision under the scrutiny of the American Bureau of Shipping (ABS). ABS has been involved in the classification of manned submersibles since 1968 when they first certified the Ben Franklin belonging to Grumman Aerospace. As part of this certification process, ABS witnessed the test of every system and component on the SPT-16.

The certification process began back in 1989 when samples of all the materials to be used were destructively tested. In addition, all welding on the vessel was subjected to 100% x-ray examination, followed by a closely controlled pressure test of the completed hull (including viewports and major systems) to 1.25 times the working depth (i.e. 125 meters or 410 feet). Once the SPT-16 was completed, a manned dive was performed (August 21, 1994) with a local surveyor aboard to the certification depth of 100 meters (330 feet). During this dive, all major systems were demonstrated to function properly and to the surveyors satisfaction. Finally, maintenance and operating manuals were submitted for review and the submarine was declared certified by ABS. In order to retain this classification, the submarine will undergo an intensive survey after its annual refit as well as a special survey every four years.

The main pressure hull, a cylinder of 1.8 meters (6 feet) inside diameter, is formed from medium tensile steel plates. Forged viewport and hatch rings are inserted and the whole of the exterior is stiffened with closely spaced T section frames. Along the sides of the deck and directly aft of the entrance hatch are the six main ballast tanks. These tanks are fitted with vent valves in the top and openings to the sea at the bottom. To bring the submarine to the surface, these tanks are blown dry with compressed air and to dive the air is released through the hydraulically opened and fail-safe spring closed vent valves.

Located amidships are the two 1 kW electric vertical thrusters, used for powering the submarine up and down in the water column. These thrusters are complemented by comparably sized, independently controlled, bow and stem thrusters mounted in the submarines skid framework to allow the pilot to rotate or crab the vessel. The 15 kW main propulsion motor, located internally, drives a large propeller housed in a steerable, unidirectional Kort nozzle providing excellent surfaced or submerged control of the vessel.

At the aft end of the deck is the submarines sail. Passengers embark and disembark from a main entrance hatch located within the sail which is equipped with a spectacular 80 cm (31.5 inch) diameter spherical sector viewport. Once submerged, passengers can enjoy a breathtaking view overhead from either this viewport or through an identically sized forward hatch viewport. Normally, the forward overhead hatch viewport, is used by the copilot during surfacing or surfaced navigation allowing the pilot to remain in his seat. A secondary helm station is located in this forward entrance hatch trunking so the submarine can be operated safely on the surface with the hatches secured as well. Once below, passengers are seated in a luxurious gray leather interior bathed in ample lighting. A state of the art Blaupunkt audio and public address system fills the cabin with either peaceful music or interesting commentary while the air conditioned cabin atmosphere is maintained with no increase in pressure to the occupants. The submarine is equipped with a metabolic makeup style life support system and the pilot carefully monitors cabin pressure, carbon dioxide, oxygen and hydrogen levels at all times throughout a dive. The submarine is equipped with three days of emergency life support for a full crew of 18 people. In addition, there are individual re-breathers for each occupant in the event of a contaminated cabin atmosphere which provide a further 4-6 hours of self contained life support.

SPT-16 description (continued)

A full height central aisle makes best use of the 1.8 meter (6 feet) diameter pressure hull and stretches from the pilots compartment to the sound-proofed machinery space bulkhead. The seating is arranged in four groups of four with each pair of passengers sharing an 80 cm (31.5 inch) diameter spherical sector viewport. This seating arrangement promotes conversation and interaction between the customers in a way which is simply not possible in the standard bench style, back to back seating of all other tourist submarines. Quartz halogen external lights illuminate the subsea vista, intensifying the abundant natural coloring both during deep daytime dives or at night. The photographic opportunities for passengers through these optically correct windows are at present, without equal in the industry. Today, there is only one other tourist submarine in existence with the depth capability of the SPT-16 which allows occupants the opportunity to explore regions of the ocean beyond the reach of conventional resort type diving.

The batteries on the SPT-16 are arranged in eight separate cases which form the back of the passengers seats. The capacity of the electrical system has been generously sized to allow for up to eight, one hour dives during an operational day. These tubular lead-acid batteries are equipped with an automated watering system to simplify battery maintenance and an elaborate hydrogen monitoring system for safety. Recharge time for these particular cells is approximately eight hours. The electrical system is split into three independent systems, a 120 Volt main, 24 Volt main and 24 Volt emergency battery bank.

The pressure hull is closed at the forward end by a spectacular 1.8 meter diameter hemispherical viewport. With the center of curvature near to the pilots eye it provides a commanding and undistorted view forward. To date, it is the largest viewport fitted to any tourist submersible. The pilots control and instrumentation panels have been deliberately positioned away from the viewport allowing passengers, particularly in the forward compartment, to enjoy this view as well. Grouped directly in front of and around the pilot are all of the controls necessary for operating the submarine. At the aft most end of the passenger compartment is the machinery space which is separated by a fire and sound proofed bulkhead.

The overall weight of the loaded submarine is controlled by the variable ballast system which consists of six external tanks located in the skid section. Water is admitted to or blown out of these tanks to compensate for various passenger loads. In addition to this a trim system filled with fresh drinking water (part of the submarines emergency life support requirement) and consisting of two external and two internal tanks located at the extreme end of the submarine allows the pilot to vary the pitch angle of the submarine.

Communication is maintained both while surfaced and submerged. A VHF marine transceiver fitted with an antenna mounted on the sail provides communication with either the support ship or main operations and ticketing office. An underwater telephone or UWT equipped with dual frequencies, two sets of transducers and output power of up to 100 Watts allows the submarine to communicate with a support ship up to 3 kilometers (2 miles) away while submerged.