GUPPY - Between WW II and the Nuclear Age

Following the Second World War, it was recognized that there was a need to improve the submerged speed, maneuverability, and endurance of our submarine force. The Greater Underwater Propulsion Power Program was instigated.

Like all programs in the military, some sort of "name" needed to be applied that would attract and hold attention. Since GUPPP didn't sound quite right, the third "P" was dropped and a "Y" added. Thus was born the word GUPPY, which had a far better ring to it since it did in fact sound more like a fish. At this time all submarines were named after undersea life.

After World War II, the Navy obtained two German Type XXI boats. These were studied and tested extensively. The lessons learned from their study led to a design that increased the battery capacity, streamlined the boat's structure, added a snorkel, and added a better fire control system. This new design created was called the TANG Class. The new boat was so much better that it made the existing fleet boat obsolete. But, the new boat was expensive. The Navy had to find a way to upgrade the existing fleet boats to match the TANG class's ability.

There were seven major conversion types: GUPPY I, GUPPY IA, GUPPY IB, GUPPY II, GUPPY IIA, GUPPY III, and the Fleet Snorkel.

The GUPPY bow dug deeply into the waves and the step sail was little protection. Control during snorkeling was difficult at best and sometimes impossible. The snorkel induction, topped by the head valve, had to be kept out of the water. If it ducked to the surface or below, or a wave hit, it would automatically slam shut. The diesel engines would keep running for a short time removing some sixteen thousand cubic feet of air from the boat's internal atmosphere per minute per engine.

It would take from ten to thirty seconds for the engines to draw enough vacuum in the boat to shut down automatically after the snorkel induction head valve shut depending on whether the boat was running on one or two engines. This occurred at a vacuum of six inches of mercury below atmosphere, equivalent to a 6000-foot altitude.

Sometimes the head valve would shut for five or six seconds then reopen as the snorkel induction again cleared the surface. The atmospheric pressure would return to normal in the next few seconds. Then the head valve would shut as another wave passed. This cycle would occur over and over for days and days.

The majority of the information about the operations of the GUPPYs during the Cold War remains classified to this day. However, without the conversion from the fleet boats of WWII to the GUPPYs of the Cold War era, the operations that the GUPPYs were responsible for would not have been possible.

The success of submarine cold war operations is directly related to the crews and the GUPPY conversions. These submarines, and their crews, certainly "Held the Line" during the Cold War until the SSNs and SSBNs took over to continue the high tradition of the United States Submarine Service

FLEET SNORKEL

U.S.S. Bergall (SS-320)

The Fleet Snorkel boats are often considered as GUPPYs. The Fleet Snorkel is a special class of boat. These boats were much like the GUPPY IIs except they didn't have some of the internal modifications that the GUPPY IIs had. They had two batteries and most still had closed cell ventilation and four engines.

They had the distinctive sails of the conversion yard but they retained their fleet bows. It was simply a fleet boat with the snorkel induction and exhaust piping and masts, and an ECM mast. Most had BQR-2 sonar in the chin mount and had sonar in the space vacated by the magazine under the galley. The auxiliary engine was replaced with two air conditioning plants.

The following were the Fleet Snorkel boats:

USS Sabalo (SS302), USS Sablefish (SS303), USS Bergall (SS320), USS Charr (SS328), USS Bugara (SS331), USS Carbonero (SS337), USS Carp (SS338), USS Cusk (SS348), USS Kraken (SS370), USS Lizardfish (SS373), USS Mapiro (SS376), USS Mero (SS378), USS Sterlet (SS392), USS Scabbardfish (SS397), USS Segundo (SS398), USS Sea Cat (SS399), USS Sea Owl (SS405), USS Sennet (SS408), USS Piper (SS409), USS Torsk (SS423), USS Argonaut (SS475), USS Runner (SS476), USS Diablo (SS479), USS Medregal (SS480), USS Requin (SS481), USS Irex (SS482).

GUPPY I

U.S.S. Odax (SS-484)

The GUPPY I boats had these changes:

Externally:

- Deck guns and associated containers were removed.
- Entire bridge/shears structure was streamlined to reduce drag.
- The periscope and radar mast support structure was enclosed.
- The faired structure which now contained the Conning Tower and mast support was now called the "Sail."
- The top of the sail was bulged out to the side to make room for SV-radar screen.
- Capstans and deck cleats were made retractable and deck rail stanchion supports were inset in the deck. All deck railings were removed when the boat rigged for dive.
- The Fleet Boat bow was removed and a rounded bow replaced it. The "GUPPY Bow."

Internally:

- Ammunition magazine was removed from under the galley and the chill and freeze boxes were moved to the after battery upper level.
- Battery power was increased with installation of 4 126 cell batteries. One and one-half of the batteries were put in the forward well in the lower level of the forward battery. One-half of a battery was put into the forward end of the pump room. Two complete batteries were placed in the after battery well.
- The battery cells (GUPPY Battery) had more, thinner plates and would generate higher amps for a longer time. However, this battery had a shorter life span, longer charging time, and required cooling water to be circulated through the battery terminals and termination bars.
- Sonar was increased to include the BQR-2 or 2A with hydrophones mounted under the forefoot in a chin mount and inboard electronics housed in the forward torpedo room.
- Two or four high speed motor and reduction gear configuration were replaced by slow speed motors.
- The batteries could be connected in series or parallel and the combination possible from this arrangement gave a wide speed range.
- All open front switchboards were replaced with enclosed units.
- 120 volt 60 Hz AC and 120 volt 400 Hz electrical systems were introduced for lighting and electronics.

The following were the GUPPY I boats:

USS Odax (SS484), USS Pomodon (SS486)

GUPPY IA

U.S.S. Caiman (SS-323)

Because of the expense of the GUPPY II program, the GUPPY IA program was devised and it provided an interim measure which saw such special features as Greater underwater propulsion power, Sargo II batteries, streamlined sail and super-structure, new masts, snorkel, and equipment updated and rearranged. These equipment changes were not as drastic as those performed on the GUPPY IIs.

These were the GUPPY IA boats:

USS Becuna (SS319), USS Blackfin (SS322), USS Caiman (SS323), USS Blenny (SS324), USS Chivo (SS341), USS Chopper (SS342), USS Atule (SS403), USS Sea Poacher

(Continued on "GUPPY," page 12)

(continued from "GUPPY," page 11)

(SS406), USS Sea Robin (SS407), USS Tench (SS417).

GUPPY IB

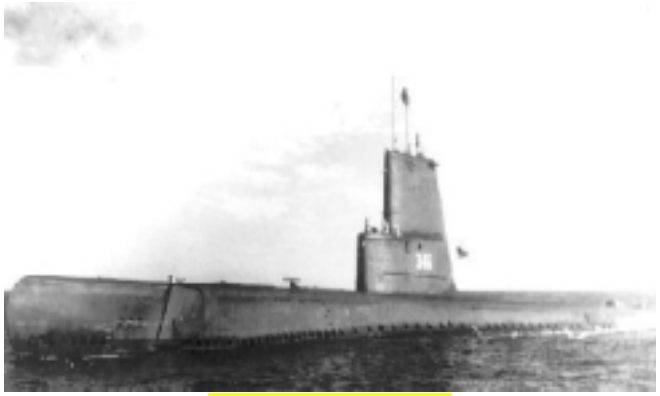
U.S.S. Hawkbill (SS-366)

The GUPPY IB program was another interim conversion which converted four boats for transfer to foreign navies. These boats had snorkels and were somewhat like the GUPPY IA except that they were not equipped with the latest sonar, fire control systems and ESM.

The GUPPY IB boats and where they were sent:

USS Barb (SS220) – (sent to Italy), USS Dace (SS247) – (sent to Italy), USS Hawkbill (SS366) – (sent to the Netherlands), USS Icefish (SS367) – (sent to the Netherlands), USS Jallao (SS368) – (sent to the Netherlands.)

GUPPY II



U.S.S. Corporal (SS-346)

The GUPPY II conversion was generally similar to the GUPPY I with the major difference being the sail.

The addition of three new masts, snorkel induction, snorkel exhaust and ESM mast, required more room in the upper portion of the sail. The structure was changed to support the new masts.

There were two different sails approved by BuShips. The Portsmouth Sail had a thinner top, curved trailing edge, square windows and a sharper lower forward edge. It was put on all boats which used the government plans for the conversion.

The EB sail had a straight trailing edge, round windows, a wider top and a more rounded forward edge. Some boats with a Portsmouth sail had the SV-radar with the large screen. Those boats needed extra room to house the antenna, thus had a bulge at the sail top. Later mods put the SS or SS2 radars on these and other boats which had a smaller antenna and had an indicator with interlocks which allowed the mast to be housed only with the antenna in certain angular positions.

All boats converted during the GUPPY II program which had high speed drive motors with reduction gear had these replaced with low speed direct drive motors of 2500 hp per shaft.

The battery wells were enlarged to accept 504 GUPPY cells in four batteries. The boats had their bows replaced and the entire superstructure streamlined.

The conversion to the GUPPY II models started in 1947 and lasted for 5 years.

The following were the GUPPY II boats:

USS Catfish (SS339), USS Clamagore (SS343), USS Cobbler (SS344), USS Cochino (SS345), USS Corporal (SS346), USS Cubera (SS347), USS Diodon (SS349), USS Dogfish (SS350), USS Greenfish (SS351), USS Halfbeak (SS352), USS Tiru (SS416), USS Trumpetfish (SS425), USS Tusk (SS426), USS Cutlass (SS478), USS Sea Leopard (SS483), USS Odax (SS484), USS Sirago (SS485), USS Pomodon (SS486), USS Remora (SS487), USS Volador (SS490), USS Amberjack (SS522), USS Grampus (SS523), USS Pickerel (SS524), USS Grenadier (SS525)

GUPPY IIA

U.S.S. Razorback (SS-394)

Much like the GUPPY II, the IIA streamlined the boat, installed a new sail, a GUPPY bow, and new motors where

necessary.
One of the forward engines was removed. In this space, air conditioning plants and refrigeration units were installed. Some boats had the high pressure air compressors relocated to the lower level of the forward engine room.

The chill box and freeze boxes were moved to the forward end of the after battery under the galley. Sonar was moved to the space now available in the forward end of the pump room.

The GUPPY IIA had the same outward appearance as the GUPPY II, except the IIA had only three diesel exhaust outlets and the II had four.

These were the GUPPY IIA's:

USS Entemedor (SS340), USS Diodon (SS349), USS Hardhead (SS365), USS Jallao (SS368), USS Menhaden (SS377), USS Picuda (SS382), USS Bang (SS385), USS Pomfret (SS391), USS Razorback (SS394), USS Ronquil (SS396), USS Sea Fox (SS402), USS Threadfin (SS410), USS Stickleback (SS415), USS Thornback (SS418), USS Trante (SS420), USS Trutta (SS421), USS Quillback (SS424)

GUPPY III

U.S.S. Corporal (SS-346)
(after GUPPY III conversion)

A problem that became evident in the mid-1950 operations was the increasing amount of electronic equipment that was required on a submarine. The ESM equipment, the sonar equipment and the new fire control computer took up a lot of space.

Certain boats, which already had the majority of the GUPPY conversion work done (GUPPY II) and in decent condition, were taken into the shipyard. There, they were cut in half and lengthened with a new 15 foot section.

The extension was in the forward end of the control room and created a new space for sonar. (USS Tiru was only lengthened 12.5 feet instead of 15.) The Conning Tower was renewed with an additional 5 foot section to accommodate the Mk 101 fire control system and Mk 37 director.

The GUPPY III conversion was accomplished as a part of the Fleet Rehabilitation and Modernization (FRAM) program. These four-battery, four-engine boats became GUPPY III. The "Northern Sail" was also added, as it was on other classes of GUPPYs, in order to get the bridge higher which allowed it to be manned in severe weather.

USS Tiru retained its three engine arrangement.

The GUPPY III boats:

USS Clamagore (SS343), USS Cobbler (SS344), USS Corporal (SS346), USS Greenfish (SS351), USS Tiru (SS416), USS Trumpetfish (SS425), USS Remora (SS487), USS Volador (SS490), USS Pickerel (SS524).

(continued from "ORPHANAGE," page 9)

Ben and other volumteers doing some much needed repairs.

The entrance to the orphanage. How is your Spanish? Any translations?