# By Alan J. Zulberti

Photo 1. Model underway in Lake Tahoe, CA.

hen I was about ten years old, I read a fabulously exiting book about the famous Patrol Torpedo Boats of WWII. Their crews were courageous and the boats were fast, heavily armed, and operated against the enemy at night. Such excitement for a ten year old is quite impressive and leaves a lasting imprint.

Many years later I noticed there were preciously few models of these very fast and famous man-of-war boats of WWII, much less ones with operational weapons systems. Since it can also be said that challenge is the mother of motivation, it seemed perfectly sensible to build a 1/16th-scale model of a WWII PT-Boat.

This sent me off on a course of events starting with studying the history of the PT-Boats, their construction, the tactics they employed in combat, and the weapon systems they so effectively used against an enemy who named them Mosquito and Devil boats.

#### The History of the PT Boat

After the Japanese strike on Pearl Harbor sent the preponderance of the US Pacific feet to the bottom, General Douglas MacArthur asked the War Department to build heavily armed high speed PT-Boats to interdict the naval supply lines to and from the many islands and territories occupied by the Japanese in the South Pacific.

Elco, one of three contractors, licensed a

British hull design as the basis for the PT-Boats of WWII. The boats were constructed of 132 different types of wood, and they were very strong. The PT-Boats were typically manned by crews of eleven men. They were highly effective in their mission, using radar at night to hunt and sink Japanese ships with their torpedoes. The ability to operate at night also allowed the PT-Boats to remaining masked from Japanese enemy fire, and their high speed of 40 to 45 knots provided them with an additional effective defense. Heavy losses from the PT-Boat's torpedoes caused the Japanese to change tactics by keeping their ships further out of range at sea, while off loading their troops and supplies onto barges for the final few miles to the islands. PT-Boat commanders changed tactics also, effectively employing the PT-Boat's guns in "Barge Busting" operations that sent many Japanese barges to the bottom.

Sadly, most of the PT-Boats were destroyed and burned in Samar Bay in the Philippines at war's end. Hollywood, however, kept the legacy of these formidable boats alive with the John Wayne movie, *They Were Expendable* and Jack Kennedy's *PT-109*.

#### The Original PT – 588

Nearing the end of the war, the original PT-588 was officially commissioned on April 10, 1945. It was one of the newest eighty-foot model PT- Boats



Photo 2. Waterline profile. So perfect, it's hard to tell it's a model!

manufactured by the Electric Boat Company (Elco - Later known as General Dynamics) which was equipped with the latest armament including a 40 mm. Bofors cannon and sixteen five-inch finstabilized rockets, giving the vessel the fire power of a destroyer. These were the most heavily armed vessels, per ton, commissioned by the U.S. Navy during WWII. They were powered by three 1,500horse-power V12 Packard engines and carried 3,000-gallons of high octane aviation fuel.

### **Operational & Craftsmanship of the Model**

I knew this was going to be the ultimate challenge, particularly since the only other creditable boat modeling project I've ever undertaken is that of building a 48" sloop from scratch, when I was sixteen; then rebuilding it about three years ago. The sloop took "Best in Sail" at the San Francisco Model Yacht Club's 2004 Frostbite Regatta.

Having been around boats all my life, I have learned that wood is not the best construction material for use in water: therefore, I elected to purchase a 1/16th fiberglass hull from Mosquito Boats. The principle advantage of a 1/16th (five-foot) hull over a 1/20 scale hull is the substantial difference in volume within the hull which is necessary to house all of the mechanical and electrical systems to support the goal of building a model with operational weapons systems. The hull houses three Astro Flight 25 motors, prop shafts, rudder servo, main electrical panel and battery. The other eight servos and all of the supporting mechanical systems are suspended from the model's deck beams. The entire deck is removable by releasing four aircraft style Dzus fasteners which allows easy access to all of PT-588's electrical and operational systems. PT-588 is an assemblage of several complex individual projects. The operational torpedoes can be used as a very good example. The goal, of course, is to be able to launch the torpedoes remotely and have them travel trough the water at a scale speed of 40-knots, or more. However, there are four critical elements one must achieve in order accomplish this goal:

- 1. The nose of a torpedo must be perfectly symmetrical to keep it going straight.
- 2. The two propellers must counter rotate.
- 3. There can be no more than five to ten percent buoyancy in order to keep the props in the water.

4. The center of gravity must be slightly aft of center; otherwise, the torpedoes will bury themselves in the mud below.

The main body of the torpedo is from a standard medical industry centrifuge tube, with the aft portion turned on a lathe from solid acrylic plastic round stock. There are twin electric motors with concentric shafts and the motors are powered by three AAA batteries. The motors are activated by a reed switch, counter rotate at 7,000-rpm. and propel the torpedoes through the water at a scale speed of 63-knots! The torpedoes are launched from the hand crafted brass roll off racks each made up of fifty-four individual parts soldered together. There is a magnet mounted in the base of the roll off rack which holds the reed switch open



Photo 3. Close-up of torpedoes in roll off racks.



Photo 4. Close-up of rocket launcher.

until the torpedo clears the side of the boat.

All of the other systems on PT-588 provide similar challenging characteristics as the torpedoes. The rocket launches simultaneously swing aft and outboard of the gunnels, while increasing in elevation into the firing position. The rockets are simple, but visually effective bottle rockets which go out about one hundred feet whistling and exploding thirty to forty feet in the air.

The boat employs an aircraft style battery bus electrical system which is powered by a 12-volt 18.5-Amp.-Hr. Lithium Ion battery used in military missile applications. Like everything else in the military, the battery is lightweight, powerful, compact and expensive.

While on the subject of expense, everyone should take comfort in knowing the expense of building PT-588 is substantially less than the cost of a wife's wardrobe!

There is also a video cam onboard PT-588 which will transmit its signal to a laptop in order to better aim the weapons systems. The smoke



Photo 5. View under the hood.



Photo 6. Smoke-screen being laid.

## **Summary of Operational characteristics:**

- Three independently operational, geared electric motors with separate electronic speed controls.
- All five guns rotate in azimuth and three adjust in elevation
- The 37 mm. deck cannon is designed to fire 3 mm. rounds
- Rocket launchers rotate outboard simultaneously and increase in elevation into the rocket launching position
- Torpedoes are individually launched, have twin 7,000-rpm. motors with counter-rotating propellers which drive the torpedoes through the water at 63 kts. scale-speed.
- Smoke generator is remotely activated
- Sound system –digital recording of V12 engines slaved to rpm motor settings on custom made sound board. Engine start sequence and horn. General quarters and weapons firing may be added at a later date.
- Rotating radar antenna at 16-rpm.
- Operational Video cam
- Life raft will self deploy with a 300-foot recovery line attached should the vessel ever sink
- Complete interior and exterior lighting system with individually switched search light
- Operational run time is well over two hours depending upon speed considerations.

### **Craftsmanship**:

- The deck is individually laid scale teak planking
- The 20 mm. and twin 50 cal. turret guns are cast lead
- The 37 mm. deck gun, rocket launchers, 40 mm. rear deck cannon, torpedo roll-off racks and the radar tower are all individually hand crafted of brass, with each piece containing between 50 and 150 individual brass parts soldered together.
- Torpedoes are fabricated from acrylic centrifuge tubes with the aft portion machined on a lathe from solid round stock.
- The anchor and all of the deck fittings are individually cast of brass by Ken Valk.
- All handrails are handcrafted of brass.
- PT–588 designation and commission numbers are custom made letter transfers.
- All 37 mm., 40 mm. and 20 mm. ammo box rounds are handcrafted of brass.
- The forward deck air vents rotate.
- Given the size and weight of PT-588, a custom made chariot was constructed to transport the boat. The chariot incorporates a removable display stand, wheel suspension system, and steerable nose gear with a parking brake.

### **PT-588** Credits and Specifications:

- Design, development and construction time Three plus years with considerable help from John Drain in Australia at <u>http://www.pt-boat.com/</u>
- The original U.S.S. PT-588 was commissioned 10 Apr. 1945.
- Hull and deck structures 1/16th scale, sixty inch, fiberglass Dumas hull purchased through Mosquito Boats.
- Power plants Three Astro Flight 25 10 Amp. geared motors turning at 5,892-rpm. with 30A ESCs.
- 55 mm. Props and shafts Raboesch of The Netherlands
- Battery UltraLife 12volt 18.5 Amp. Hr three pound battery developed for use in military missile applications.
- Electrical system aircraft style battery bus system with custom made power bus to power lower voltage radio equipment and accessories.
- Custom made rocket launcher fire control sequencing PCB is still in the making and designed to fire four volleys of four rockets each.
- Radar antenna rotates at 16 rpm. driven by a Robbe miniature motor.
- The 40 mm. Bofors cannon is handcrafted of brass by GMS Model Building of St. Petersburg, Russia.
- Radio system Robbe of Germany F-14 Navy 28 channel radio, nine servos, and four electronic relay switches
- Sound system Digital recording of actual V12 engines from the 1939 vessel Thunderbird, which is now featured on a US Postal Service stamp. The sound board is from Dallee Electronics of the US.
- Complete deck structure is removable from the hull by loosening the four aircraft-style Dzus fasteners.

generator sends out a plume of white smoke providing cover and concealment. All of the gun systems rotate in azimuth, with three of them having elevation control. The 37 mm. deck gun is set up to fire 3 mm. rounds. The radar antenna rotates at 16 rpm. and there is a complete exterior and interior lighting system.

The one characteristic of PT-588 that is most



Photo 7. Model underway, starboard view.

impressive is the actual digital V12 engine sound system that spools up with increased motor rpm. This was a real challenge to accomplish, but the character it provides the boat is most humbling.

PT-588 uses a twenty-eight channel radio that is customized to individually operate the boat's three motors. Power to operate the radio's receiver and two switching and proportional modules, as well as the video cam. radar antenna, lighting and sound system is provided by a custom made power distribution printed circuit board which steps main bus 12volt power down to 9- and 6-volts

## Alan J. Zulberti

Note: Pictures of PT-588 underway taken by John Linneman.



**Photo 8.** Alan with his model. Alan is a former military pilot with careers in corporate finance and investment real estate. He is retired, builds model boats, airplanes, railroads and devotes time as an Adult Leader in the Boy Scouts of America and has written several newspaper op/ed articles on various subjects.