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THE MOTOR TORPEDO BOAT - PAST, PRESENT AND FUTURE  
HISTORY  
DEVELOPMENT  
EMPLOYMENT AND TACTICS  
ACCOMPLISHMENTS TO 1 FEBRUARY 1943

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## HISTORY

"The Insignificant Often Are The Most To Be Feared" -- La Fontaine.

With the passing of sail and the advent of the modern machine age came a new and untried weapon -- a small fast torpedo carrier which was destined to become our speediest and most streamlined naval vessel. In recent years, perhaps no naval vessel has created more public interest than the Motor Torpedo Boat. However, the history of the Motor Torpedo Boat does not begin with the present conflict but rather had its christening in the sixth year of the twentieth century. By the beginning of the first World War, Italy, Germany and England had all taken an active part in small fast surface torpedo craft development, and today the Motor Torpedo Boat of one type or another forms an important part of nearly every Navy.

Italy made the first progress with a successful torpedo carrying motor boat in 1906 -- only thirty-seven years ago. This initiated their development of a Motor Torpedo Boat that at least partially met with requirements by the time the first World War started. The type of boat they had in commission by 1914 was a 10 ton design, 52 feet long. By 1916 their boats were from 50 to 69 feet long, carried from 2 to 4 small torpedoes, and one or two machine guns. In general the boats were capable of a speed of about 33 knots and had very little free board.

In order to enable them to approach their objective in silence, they were equipped with two electric motors furnished with accumulator batteries. These motor torpedo anti-submarine boats, (MAS) as the Italian boats were called, were used for attacking surface vessels, coastal reconnaissance, escorting seaplanes, minesweeping, and chasing enemy submarines.

The significance of the Motor Torpedo Boat in naval operations can be illustrated by the exploits of the Italian M.A.S. against the Austrian Navy, which resulted in the final reduction of morale and discipline in the latter. During the first World War Austria was receiving many of her supplies from overseas; this gave Italy a good opportunity to attack their maritime communications and ports of call. However, there was a question as to which type vessel could best be used for this task. This was where the idea of using the M.A.S. came into being and in May, 1916, the organization of the first Italian Motor Torpedo Boat program was completed.

The first action was in the form of a raid on the night of June 6, 1916. The raid was on the Bay of Durazzo and was carried out by two M.A.S. from a Brindisi base. The boats were supported by destroyers which towed them most of the way, in order to conserve the motors. (Towing has not been very successful with our PTs because the distances are considerable and the boat design is such that damage is inflicted regardless of where the tow is taken). In the bay they sighted a large steamer at anchor, the LUKRUM. One torpedo was fired which made a direct hit and resulted in the sinking of that vessel. During that night the Austrians did not discover the presence of the M.A.S. and thus they were uncertain as to the method used to sink the LUKRUM.

On June 25, 1916, the bay was raided again, however this time the Austrians were on the alert and the M.A.S.'s were subjected to heavy gun fire. In spite of this a second steamer anchored in the bay was torpedoed and sunk.

On August 1, 1916, under heavy enemy gunfire another raid in the bay failed in that the torpedoes fired did not hit the mark, however, the boats did escape safely. Raids were suspended until November, at which time the Austrians had laid nets to protect the entrance to the bay.

In November, two M.A.S.'s penetrated the bay again, but being confronted by search lights and heavy gun fire, they withdrew after firing torpedoes at a large steamer which resulted only in the torpedoes striking the protective net. The M.A.S.'s were then chased by well armed enemy vessels, but no damage to the boats was inflicted.

It is interesting to note that the Italian M.A.S.'s used aircraft reconnaissance to keep them informed of enemy activity. This was the first instance of the co-ordination of aerial reconnaissance with Motor Torpedo Boats', and the possibilities still remain undeveloped. In the upper Adriatic, during November, aerial reconnaissance over Pola and the Canal of Fesana (near the Austrian Fleet Base) showed important surface units anchored in the Fesana Canal for several days at a time, the entrance to which was protected by a series of logs linked together. Aided by a torpedo boat, which was equipped with apparatus to destroy such obstructions, another boat entered the Canal and made two attempts to torpedo an old battleship anchored there: Both attempts were frustrated by anti-torpedo nets surrounding the battleship. The exit as well as the entrance to the canal was effected without damage to the M.A.S.

In 1917 the M.A.S.'s were principally used for protection of surface craft from submarines, for minelaying, and reconnaissance in the vicinity of enemy restricted waters. However, it was desired to use the M.A.S.'s for work of a more offensive nature. The opportunity arrived when two Austrian battleships, the WIEN and the BUDAPEST, were located in Trieste presumably for an operation in conjunction with the Austrian Army. The initial engagement near Trieste bore no results at the time, but was the beginning of actions which had as their objective, the destruction of these two battleships.

Near Trieste on November 16, 1917, a daylight torpedo attack, from a distance of a few hundred yards, did not hit the ships because of the latter's remarkable maneuvering. At the time of the attack, the battleships were intent on bombarding the naval battery at Cortellazzo, a very important defense in the lower Piava. The attack by Italian M.A.S. however did succeed in making the battleship withdraw and abandon their bombardment.

The Italians believed it advisable to take the initiative and after much night reconnaissance around Trieste, plans were developed for torpedoing the two battleships. On the night of December 9th, in a thick fog, two M.A.S. escorted by other light vessels reached

the entrance to the Port of Trieste and after cutting some metal cables succeeded in forcing an entrance. After careful search the battleships were revealed and attacked with torpedoes. The WIEN was hit and went down immediately, and the BUDAPEST, anchored nearby, was hit, but only slightly damaged. The M.A.S. were able to escape in the confusion that followed, the way they had entered. The loss of the WIEN had a bad effect on the morale of the Austrian Navy.

The year 1918 was perhaps the most successful for the Italian M.A.S.; the life line of Austrian merchant traffic was considerably hampered by the M.A.S. raids during this year.

The operations on June 8, 1918, against the Canal of Otranto was very successful because they further weakened the Austrian Navy. Large units escorted by torpedo boats, and M.A.S. operating independently, made up the striking forces. Two M.A.S. explored the waters between the rock of Gruizza and Selve, on patrol until dawn. After exploring the area the two M.A.S. came out of the Strait at about two A.M. and headed slowly toward the open sea to join the other units. About three A.M. a large cloud of smoke was sighted to starboard. Taking the initiative the boats investigated and found two large warships escorted by about ten destroyers. One M.A.S. maneuvered and laid itself near the first large warship and fired two torpedoes at about 350 yards. It was the SZENT ISTVAN (ST. STEPHEN), most recent ship of her type, and she went to the bottom two and a half hours later, despite all efforts to save her. The other M.A.S. attacked the second ship without successful hits. One escorting destroyer sighted the M.A.S. and steamed after them. Then the M.A.S. dropped depth charges and the pursuit was broken up.

Success continued and on October 31, the nets were forced at Pola and a large warship, the VIRIBUS UNITIS was sunk. This resulted in complete revolt and loss of discipline in the Austrian Navy.

These Italian actions alone show the value of Motor Torpedo Boats in operations against coastal merchant shipping, warships, minelaying, and surprise raids in harbors with unprotected entrances.

The Coastal Motor Boat (CMB) was the British version of the small fast torpedo craft and was developed in 1916 as a result of considerable design work. They were forty feet long with a speed of about thirty knots, carried two small torpedoes, three machine guns and a crew of three men. These boats were mostly Thornycraft design with a single step hull. By the end of the last war Britain had constructed a total of 66 CMB's, of which only six were lost. Three of them were mined, two were sunk in a collision and the sixth was wrecked off Dover. The CMB's unsupported by other craft formed a Dover patrol from August to November after the war started. Some were sent to the Dardanelles and by the spring of 1917 they had proved their worth in several actions.

The CMB's played an important and spectacular part in the attacks on Zeebrugge and Ostend in April, 1918. Their main task was laying smoke buoys in advanced positions. They also laid smoke screens around the harbor entrance by using chlor-sulphonic acid in their exhausts.

Routine duties of CMB's attached to the Dover Patrol in the Norwich force were mine laying, rescue of crews from fallen planes or patrol off the Belgian Coast. In one action six CMB's were attacked by eight German aircraft and all the boats were temporarily put out of commission but were not lost. This indicates the effectiveness of aircraft against the boats in the last war.

The boats were also used extensively in the raids on Kronstadt in 1919 after the Russian revolution. In these very spectacular operations, two capitol ships, a cruiser, two destroyers, and other craft were sunk or completely disabled while only two CMB's were lost (probably by mines).

Like all such small boats the CMB's were very vulnerable -- a single machine gun bullet might stop the engines, blow up or sink the boat -- and yet their losses were amazingly low.

The results achieved by the British and Italian Motor Torpedo Boats, formed the first basis to substantiate the claims of Motor Torpedo Boat supporters and must be considered responsible for the early adoption of this type craft by nearly every Navy.

As a result of the British CMB, German built boats known as Patrol Motor Boats (PMB's), which were based in the harbor of Blankenberghe, but they were slow and seemed to be ineffective. They were lacking in the proper design, probably due to the fact that Germany had no previous knowledge and experience in the building of fast motor boat cruisers.

The design and performance of German Motor Torpedo Boats have shown such remarkable improvements in this war, compared to the last, that their accomplishments are highly worthy of mention. Before and since the battle of France, Germany has used a fast armored Motor Torpedo Boat, known as the "E" boat, which has many practical uses, such as attacks against convoys, escorting duty, mine laying, rescue of Germany pilots, etc. The boat ranges in length from 80 to 110 feet, is of about 65 tons displacement and has a speed of about 30 to 36 knots. It carries from 2 to 4 torpedo tubes, several heavy machine guns, and some armor. This boat is seaworthy and can take considerable punishment. It is equipped with Diesel engines that have proven very satisfactory. (The development of a light Diesel engine that can produce the necessary power and speed, would greatly increase the effectiveness of our Motor Torpedo Boats. The fire hazard of gasoline engines and their relatively short cruising radius greatly limits their capabilities).

At first the British held the "E" Boat in contempt, but when the latter started operating in packs and disrupting British channel traffic, the British began earnestly to improve their own Motor Torpedo Boats and to use Motor Gun Boats in combatting the "E" Boats.

Motor Gun Boats are Motor Torpedo Boats that have had the tubes removed and more and heavier guns added, thus increasing the fire power. Further emphasis on the need for a weapon to combat the "E" Boat is shown by accomplishments of the "E" Boat in the first six months of this war. The British reported that only one "E" Boat was certain of being destroyed as against the following British losses: 3 destroyers, 5 trawlers, 2 submarine chasers and 21 merchant ships (47,000 tons).

After the first World War with everyone thinking of peace and disarmament the Motor Torpedo Boat program died away and little effort was made to improve the designs. It was not until the 30's, when thoughts were again turned to war, that further developments of Motor Torpedo Boats were made.

## DEVELOPMENT

The first spark of Motor Torpedo Boat enthusiasm in this country probably resulted from interest in a volunteer patrol squadron of small boats in the first World War. President Roosevelt, then Assistant Secretary of the Navy, took an active interest in Patrol Craft and persuaded A. Loring Swasey, now a Naval Reserve Captain in the Patrol Craft section of the Bureau of Ships, to build five 40 foot volunteer patrol vessels. These and many more, did considerable patrol work and were successful in that they claimed 40% of all subs destroyed by the United States in the last war.

Our early destroyers were little more than torpedo boats. They were small in size, carried torpedoes and very light additional armament. Then came a gradual increase in size to 1200 tons and later they were stepped up to 1500 and 1850 tons. With present day destroyers increased to 2100 and 2250 tons, and the entire tempo of warship construction tuned to make the large and heavy type ships larger and heavier, and in spite of the fury of modern naval warfare, there still remains a place and a need for the small fast little fellow, who can carry and deliver a heavy punch. The 80 foot subchaser (12 foot beam and 19 knot speed) built for Britain in the last war by the Electric Boat Co., also inspired an interest in the Motor Launch and Coastal Motor Boat, as used by Britain. Soon after the first World War, the Navy Department bought two British Thornycroft boats for test, (40 foot and 55 foot respectively), but no further developments or progress resulted until 1937.

General Douglas MacArthur, upon appointment to organize and build up the Filipino Army in the Philippines, became cognizant of the ever threatening dangers from Japanese aggression and the role small fast Motor Torpedo Boats might play in strengthening the Island's defenses. He realized that a peaceful nation is often blind to the dangers of war, and isolationism and economy would prevent Congress from spending enormous sums on fortifying outlying possessions isolated from most powerful countries, except for a seemingly friendly Japan. Thus he reasoned, that the Motor Torpedo Boat might provide a solution, because it could in conjunction with aircraft be constructed in a hurry at a minimum cost, and at the same time provide the Philippines with a good defensive and striking force. In this interest, he journeyed back to the United States to press his program for defense. In the United States, remote from any apparent danger, he found few people with enthusiasm for Motor Torpedo Boats, so he appealed to his old friend Admiral Leahy, then Chief of Naval Operations, to plead his dire need of 100 small fast Motor Torpedo Boats, to defend the Philippine Islands.

The final and indirect outcome of this appeal was a \$15,000,000.00 experimental appropriation put through Congress personally by President Roosevelt and Secretary Edison for the development of Motor Torpedo Boats. The reaction of most high ranking Naval officers in our Navy to the expenditure of funds for vessels of this type, at a period when the U.S. Navy was lacking in sufficient numbers of larger combatant vessels such as destroyers

and cruisers to balance up the Fleet, and also lacking in funds for proper upkeep, training and maintenance of the existing Fleet, was decidedly unfavorable. At the time it appeared to many of them in view of our foreign policy, that this country was destined to maintain a Fleet of only sufficient size to defend our coasts and possessions. The need for small Motor Torpedo Boats which could not operate with the Fleet and could not be employed except in close, in coastal defense, could not be envisioned. It was granted that the existence of Motor Torpedo Boats might be justified for use by European Powers in European waters, where probable enemy countries with nearby adjoining harbors and waters bordered each other, but for our needs, boats of this type would hardly suffice.

In spite of the opposition from the Fleet, early designs for Motor Torpedo Boats were developed without a specific employment plan in mind. One faction maintained that the size of the boat should be kept down, so that the target presentment would be negligible. Another faction claimed that the boats should be larger to increase their seaworthiness. A third insisted on the construction of Torpedo Boat Catchers, in an effort to counteract the effect of the Motor Torpedo Boat being built by potential enemy countries, while the fourth, held that since the small boats could not remain at sea for any length of time and the cruising radius would be short, there would be no need for Motor Torpedo Boat Catchers as there would be nothing for them to catch. Still another claimed it was foolish to spend \$200,000 to \$300,000 dollars for a Motor Torpedo Boat, when a torpedo plane costing about the same amount could carry a torpedo much faster and further and probably be more effective. To that, the proponents of Motor Torpedo Boats replied by stating that the type of weather that would normally ground aircraft - darkness, fog and low visibility - would prove ideal for Motor Torpedo Boat operations and besides the boats could remain at sea longer than aircraft. The result was a compromise in designs. With funds from the experimental appropriation, a competition was held open to civilian naval architects for designs of Motor Torpedo Boats and Subchasers. Prizes in each group were \$15,000 and smaller second and third prizes were also awarded. Forty-one entries were received.

In the 54 foot Motor Torpedo Boat class, first prize went to Professor George Crouch's design for Hewey B. Nevins, Inc. of New York City. Winner in the 70 foot Motor Torpedo Boat class was Sparkman and Stephens of New York City, best known for work on sailing yachts.

SLIDE \*1

In the meantime, Secretary of the Navy Edison who was by this time quite a Motor Torpedo Boat enthusiast, prevailed upon Mr. Henry Sutphen, Vice President of the Electric Boat Co. and President of the Elco Boat Works at Bayonne, New Jersey - to enter the Motor Torpedo Boat field. With only Secretary Edison's promise that he would back a suitable boat, Mr. Sutphen and the Elco designer, Mr. Irwin Chase, journeyed to England to look over the latest designs in that country. After much consideration Mr. Sutphen decided upon Mr. Hubert Scott-Paine's design, and purchased a 70 foot boat from Scott-Paine as a model, together with the blueprints and rights to build similar boats. The boat was



equipped with 3 Rolls-Royce engines and alone cost \$300,000. It was delivered to New London, Conn., September 4, 1939, three days after war broke out in Europe. Trials were held at New London for 10 days and, as results lived up to expectations this boat became the U.S.S. PT 9. Under smooth water conditions this boat made a speed approaching 50 knots. It carried four 18 inch torpedoes in 4 bow launching tubes. It's displacement under full load was about 40 tons.

SLIDE #2

There was considerable opposition in Congress and other factions, particularly American boat builders, to our Navy constructing boats of a British design. It was held that our country had progressed in small boat construction to a point where our engineers, designers and builders were equal to, if not superior to the British and should be capable of producing a superior boat. In order to appease this group and as a result of the prize winning designs requested and received by the Navy Department, together with the fact that funds were available, contracts for 8 additional Motor Torpedo Boats to be designated as PT's (Patrol Torpedo) 1 to 8 were awarded. These 8 boats were later assigned to Motor Torpedo Boat Squadron ONE. PTs 1-2 were constructed by the Miami Shipbuilding Co., Miami, Florida according to the prize winning design by Mr. Frank Crouch. Their length was 58 feet and they were of wooden construction. They were to be powered by 2 (1000 H.P.) Vimalert engines. These two boats were to carry two 21 inch stern launching torpedo tubes, 2 .50 cal. machine guns forward and a smoke generator or rack for four depth charges on the stern. The specifications required a speed of 40 knots. There was considerable difficulty in the procurement of engines for these two boats, and they were never actually delivered as Motor Torpedo Boats since they were found obsolete before they were completed. They were later designated as torpedo retrievers. The Ex PT 1 is at present attached to the Motor Torpedo Boat Squadrons Training Center and used for certain experimental work and for training.

PTs 3-4 Constructed by the Fisher Boat Works at Detroit, a branch of the Fisher Automobile Body Works. The design was similiar to that of the PTs 1 and 2 except for certain changes made by the Bureau of Ships.

These two boats were of wooden construction, 58 feet in length and powered by two 1200 H.P. Packard engines. They were also specified to make 40 knots but actually with a full load never made more than 32.

PTs 5-6 Constructed by the Higgins Industries at New Orleans from the prize winning design by Sparkman and Stevens. They were of wooden construction, 80 feet in length.

SLIDE #3

The PT 5 was powered by three 1000 H.P. Vimalert engines which gave continual trouble and after delivery of the boat never reached a greater speed than 32 knots in a light condition. The PT 6 was powered by three 1200 H.P. Packard engines and was the most satisfactory of the first eight boats. A speed of 38 knots was claimed in the initial trials but after delivery with a full load the max-

imum speed attained was about 35 knots. Two 21 inch stern launching torpedo tubes, two .50 cal. machine guns and a smoke generator or depth charge racks comprised the armament.

PTs 7-8 Constructed by the Philadelphia Navy Yard from a Bureau of Ships design. The hulls were similar in form to the PTs 1 to 4, except they were 80 feet in length.

SLIDE \* 4

The PT 7 was of wooden construction and powered by four 950 H.P. Hall-Scott supercharged engines. Two engines installed in tandem on a side, drove each of two shafts. The PT 8 was constructed of Aluminum and was powered by two 1800 H.P. Allison Aircraft engines, one on each wing shaft and a 650 H.P. Hall-Scott engine on the center shaft. The engineering plants on both of these two boats gave constant trouble and never were they able to approach the required speed of 40 knots. These two boats had mounted two 21 inch bow launching torpedo tubes, two .50 cal. machine guns and depth charge racks or a smoke screen generator.

Of these eight boats only the PT 6 proved partially satisfactory and many of its good features were incorporated in later boats. In the meantime, the PTs 10 to 19 were constructed and delivered by the Elco Boat Works, patterned after the PT 9, purchased from Mr. Scott-Paine, except that they were powered by three 1200 H.P. Packard engines instead of the three Rolls-Royce. The PTs 9-19 were commissioned as Motor Torpedo Boat Squadron TWO and were found too light in hull construction to withstand any moderate sea conditions as encountered on the Atlantic Coast. After a shakedown cruise to Cuba during which numerous hull casualties were suffered, this group of boats plus the PT's 3, 4, 5, 6, and 7 were transferred to the British at New York under Lend Lease.

SLIDE \* 1

During this period a new \$5,000,000 contract was let to the Elco Boat Works for a larger boat of the Scott-Paine Hull design which was to be capable of carrying four 21 inch torpedoes and was to have approximately the same speed as the PT 9 class. This boat was 77 feet in length and with full military load displaced about 50 tons. This increase in size was probably due to the fact that the General Board decided these boats must be armed with 4 torpedoes and as no satisfactory 18 inch torpedoes had been developed by our Navy, it was necessary to resort to the heavier 21 inch torpedoes and tubes requiring a larger boat. It was this class of boats with their personnel that later gave such a good account of themselves in the Philippines and at Pearl Harbor.

Part of this contract provided for construction of PTC's (Patrol, Torpedo Boat Subchasers). The difference between the PT's and PTC's was only a matter of armament and equipment. Instead of carrying 4 torpedoes, the PTC's carried two 21 inch torpedoes forward and about a total of 16 depth charges in racks and two Y guns aft. They were also to be fitted with sound equipment. The first 4 PTC's were tested for several months with sound equipment of various types installed and it was found that sound equip-

ment could not be satisfactorily used on board boats of this type. The engine and propeller noises and shallow draft of the vessels resulting in a great deal of interference, and the sound projector being in and out of the water in choppy seas, made underway sound search almost impossible. The PTC's already constructed were then transferred to the British and the remainder constructed as PT's.

By July 1941, PT's 20-48 patterned after the Scott-Paine design, were completed by the Elco Boat Works and delivered to the Navy. They were commissioned as the second Motor Torpedo Boat Squadrons ONE and TWO. In addition to the four 21 inch torpedoes, these vessels were armed with 2 twin .50 cal. machine guns mounted in two power pneumatic-hydraulic turrets, a design procured by Scott-Paine from the Belgian Government. They also carried a 32 gallon smoke generator on the stern. The crews for each consisted of 2 officers and 8 men.

There were numerous claims as to the speed capabilities of these boats. Actually, in a light condition and in smooth seas they attained a speed of about 45 knots. With full military load and under service conditions their maximum speed was about 40 knots. These boats were remarkably seaworthy but in moderate seas from ahead were very wet and pounded heavily due to the hard chine forward and the flat bottom. This resulted in many hull casualties and indicated that too much strength had been sacrificed for weight and speed. Under smooth water conditions the boats were excellent.

During this period while the Navy was debating whether to go any further in the PT boat construction program and having been somewhat shocked by the high costs of maintenance, upkeep and repair of existing Motor Torpedo Boats, two other boat builders, the Higgins Industries at New Orleans and the Huckins Yacht Corp., at Jacksonville, each offered to construct a superior type of Motor Torpedo Boat at their own expense, if after completion and the vessels proved to fulfill the highly optimistic claims of the builders, the Navy would purchase them. These two contractors were apparently given some assurance and encouragement by the Bureau of Ships, as both undertook construction of their pet designs and the vessels were completed in July 1941. The Huckins boat later designated as PT 69 was 70 feet long, had a remarkably low silhouette and was powered by four 1200 H.P. Packard engines each driving a separate shaft. It was of very light hull construction.

The Higgins boat initially termed the "Higgins Dream Boat" and later designated as the PT 70, was 76 feet long, heavily constructed, had a very wide beam, was high forward and very low aft.

The appearance of these two boats and the extravagant claims made by the various parties concerned, produced considerable controversy, conjecture and arguments. To settle the question as to the future design of Motor Torpedo Boats and to satisfy all factions concerned, the Chief of Naval Operations directed the Board of Inspection and Survey to hold competitive trials of all types of boats off New London, Conn. The contractors and other interested parties were invited to attend and enter their boats. These trials were

later referred to as the "1st Plywood Darby".

The following types of boats were entered:

Three Elco 77 Foot boats already commissioned and delivered to the Navy.

The PT 6 (Higgins design - postponement of transfer to British was withheld so this boat could participate).

The PT 8 - (Bureau of Ships design, constructed by Philadelphia Navy Yard. The Bureau of Ships was very proud of this design, which was probably the reason it was not transferred to the British).

The PT 69 - (Huckins - this boat had not yet been accepted by the Navy and was manned by contractor personnel).

SLIDE #7

The PT 70 - (Higgins - this boat was not yet accepted by the Navy and was also manned by contractor personnel. In fact, Andrew J. Higgins himself and two sons rode the boat).

British 70 foot Motor Rescue Boat - (Built by Higgins and entered as a matter of interest. Manned by the Contractor).

All boats were finally assembled at New London and after a day or two of arguments in checking ballast and weights to be carried, standardization over the measured mile and photographing turning circles, the climax of the trials took place. All boats lined up at Race Light in Long Island Sound and upon signal raced around Block Island down to Fire Island Light Ship and back to the finish line at Montauk Point, a distance of about 160 miles. A new destroyer and a Blimp as a covering force also took part in the race to give it added color.

SLIDE #8

The Elco boats, manned by Navy personnel finished first. The PT 20 averaged a speed of about 38 knots. The Huckins PT 69, finished next and claimed several engine casualties had retarded their average speed of about 35 knots. The PT 6 finished next, having averaged about 33 knots and the PT 8 last with an average speed of about 30 knots. The two Higgins boats, PT 70 and the British MRB, were forced to withdraw due to engine casualties when partially around the course. The sea conditions during this race were very calm. This set of trials did not appear to satisfy anyone except the Elco Co. The other builders claimed a lack of time to prepare their vessels, ballast to provide the weight of absent armament had slipped and caused an unequal distribution of weight, etc. As a result a second set of trials were scheduled which was called the "2nd Plywood Darby". In the meantime the Navy accepted the Huckins PT 69 and the Higgins PT 70 and started fitting them out.

The "2nd Plywood Darby" was somewhat a repetition of the first, except that sea conditions were much rougher. The Elco PT 21 finished first, the Higgins PT 70 second, however the latter was very badly broken up. The Huckins PT 69 began cracking very early in the race and was forced to withdraw. The PT 6 - Higgins - had been previously turned over to the British and did not participate, and the PT 8 finished in her usual last place.

As a result of these trials, the Board of Inspection and Survey recommended that the Bureau of Ships undertake design of a boat incorporating the good features of all the existing types and thus standardize the type. The idea then being to award contracts for a standard type boat to all the interested builders. The PTs 8, 69 and 70 were decommissioned and converted to YPs. The YP 103 now assigned to the Naval Torpedo Station and slightly altered was formerly the "Higgins Dream Boat" - PT 70.

About this time three Elco 77 foot boats from Squadron ONE, and three from Squadron TWO were selected and commissioned as Motor Torpedo Boat Squadron THREE. Under the command of Lieutenant J. D. BULKELEY, U.S.N., they were loaded aboard one tanker and shipped to the Philippines where they arrived in October, 1941. A few weeks later Motor Torpedo Boat Squadron ONE, consisting of 12 Elco constructed PTs under the command of Lieutenant Commander W. C. SPECHT, U.S.N., were loaded aboard two tankers and shipped to Pearl Harbor where they arrived the latter part of August, 1941. Shortly after the outbreak of war on December 7, 1941, Motor Torpedo Boat Squadron TWO, consisting of 11 Elco constructed PTs under the command of Lieutenant Commander E. S. CALDWELL, U.S.N., were transported in the same manner to Panama.

After this period and while the achievements of Motor Torpedo Boats operating in the field were still to be heard from, the Elco Boat Works, Higgins Industries and Huckins Yacht Corp., began working on new designs in an attempt to provide one along the lines proposed by the Board of Inspection and Survey. By this time the type of engine had been standardized on Packard. It had proven itself as very reliable and left little to be desired in the way of a suitable gasoline power plant.

In view of the fact that the three new designs submitted by Elco, Higgins and Huckins appeared to be somewhat similar in hull design and all had similar machinery, together with the idea of promoting competition, the Bureau of Ships awarded contracts to each company for construction of their own designs. These boats were 80 feet in length about 21 foot beam, 5 foot draft and with full military load displaced about 110,000 pounds. They were to carry as armament four 21 inch torpedoes - 2 twin .50 cal. A.A. machine guns in two mounts - one 20 m/m Oerlikon A.A. gun and a smoke screen generator. Very peculiarly no speed specifications were written in the contracts although it was generally understood that they should be capable of at least 40 knots.

The first boats of the new and larger types were delivered by the Elco Boat Works and were in general very satisfactory.

They were considerably stronger than the previous Scott-Paine design, drier in rough waters and much softer riding. With a full military load, and under service conditions they were capable of speeds slightly in excess of 40 knots.

SLIDE \* 9

The first boats delivered by Huckins and Higgins were completely unsatisfactory in almost every respect and after much protest and many unsatisfactory reports from operating personnel, Higgins was given a deadline date by the Bureau of Ships to produce a satisfactory boat under threat of cancellation of contract. It was decided to make the Huckins Yacht Corp. correct as many deficiencies as possible in existing boats they had delivered and in view of the fact that this company had been given a contract for only 20, to let no further contracts for that design after completion of those 20 boats.

After a great number of changes, alterations and redesigning, Higgins Industries were able to produce a boat that was much more satisfactory than the first deliveries, and one which was acceptable to the Navy Department and to the operating personnel. The operating personnel made repeated efforts to induce the Navy Department to standardize on one type of boat to facilitate upkeep, repair, familiarity and training of personnel and procurement of spare parts. For various reasons this was not considered practicable and the design of future boats will probably be frozen to the two new types - Elco and Higgins.

SLIDE \* 10

Very recently a novel new type of semi-submersible Motor Torpedo Boat was tested in Narragansett Bay by the Board of Inspection and Survey. It was about 44 feet long, 8 foot beam, about 2 feet draft and displaced about 9 tons. It resembled an aircraft pontoon with a small conning tower aft and was powered by a 350 H.P. Scripps engine. Housed inside the forward compartment in racks abreast each other were two 18 inch torpedoes. Around the sides were built in, air buoyancy tanks. Prior to firing the torpedoes, two doors in the bow were opened by levers in the cockpit, flooding the forward compartment and giving free access for the torpedoes to get out. This flooding placed the boat in a semi-submerged condition with a free-board of about one foot. Under these conditions the boat was able to make a maximum speed of 8 knots and presented very little silhouette. The torpedoes when started, being submerged in the flooded compartment, were thus enabled to use their own power in clearing from the interior of the boat. After torpedoes were fired, a high capacity pump driven by the main engine was used to pump out the forward compartment, which it was able to do in about 3 minutes. The boat thus freed of torpedoes and water was capable of making about 25 knots in escaping. It carried no guns and a crew of two. Its primary purpose was for sneak attacks in harbors or inshore. Its light weight would enable nearly any type of large ship to carry several on board. Further development and use of this type remains to be seen.

SLIDE \* 11

The PTs now in operation range from 77 feet to 80 feet in length, have three 1350 H.P. engines with a full load speed of around 41 knots, and a very simple torpedo director, with a choice of either 4 torpedo tubes or two torpedo tubes and 8 depth charge or 4 mine

racks, two fifty calibre machine guns and a 20 m/m gun, a good T.C.S. radio, a smoke screen generator and on some boats radar and R.D.F. Each boat carries a complement of 11, 2 officers and 9 men.

Equipment of important nature to be added soon or improved upon includes, radar and R.D.F. for all boats, new type smoke generator capable of laying smoke for 30 minutes, 1500 H.P. engines to replace engines now in use and a gun mount consisting of 4 twenty MM guns bunched together in one light weight power driven mount.

The engine development started with trial uses of Hall Scott, Vimalert, Allison aircraft engine, Rolls-Royce and Packard. The Packard engine proved its superiority and reliability early in the program and is now the standard engine. Production rates are such that each squadron of twelve boats can carry 100% spare engines.

The Packard engine now used was developed as an aircraft engine in 1925 and later converted by Gar-Wood for marine use, the engine as converted was then capable of developing 750 H.P. Improvement continued until the 1350 H.P. now in use was developed. Packard is still working to improve even more the take off rating and to make a 1700 H.P. engine. The present engine uses 500 gallons of 100 octane gasoline per hour at 39 knots. The boats have a cruising radius of 1500 miles at 8 knots or 250 miles at 41 knots. Their fuel capacity is 3000 gallons of 100 octane gasoline. Experimentation is continuing with a new type carburetor which will at lower speeds increase the cruising radius as much as 75%.

At present, i.e., March 1, 1943, our PT program is under good control and expanding rapidly and with the great American production rate going full speed ahead. We have in service a total of 178 PT boats of the following types: 48 Elco 77 foot boats, 90 Elco 80 foot boats, 24 Higgins 80 foot boats, 12 Huckins 80 foot boats, 4 Dutch Scott-Paine 70 foot boats procured under reverse lend lease. Boats to be produced already contracted and building: 103 Elco 80 foot boats, 107 Higgins 80 foot boats and 6 Huckins boats. With the change in naval tactics from day time fleet engagements to close in night fighting and with Island to Island occupational tactics, PTs are becoming a vital factor and an urgent need in our Pacific war. As soon as production permits they will also probably operate in other theatres.

The primary mission of Motor Torpedo Boats as set forth in doctrine is to attack enemy surface vessels. Their high speed, maneuverability and torpedo armament makes them most suitable for surprise attacks against enemy surface vessels at night or during low visibility.

Secondary missions which Motor Torpedo Boats may be called upon at times to fulfill are listed as follows:

- (a) Anti-submarine operations
- (b) Emergency rescue vessels
- (c) Escort duty
- (d) Minelaying
- (e) Commando Missions

It is necessary to remember that Motor Torpedo Boats like aircraft are not a "cure all" and employment for other purposes than for which designed, tends to reduce their life and effectiveness when called upon to fulfill their primary mission. Such uses as Picket duty, anti-submarine patrol and high speed transportation, places unnecessary hours on the engines and other short life equipment, thus generally reducing the boats efficiency.

Motor Torpedo Boats like aircraft require experienced and qualified operating personnel, adequate base and tender repair facilities and expert ground and servicing crews. Any provisions short of this are inadequate, as the requirements of constant upkeep and maintenance of hulls, machinery and armament are the greatest obstacles to proper and effective Motor Torpedo Boat operations. This fact has finally been recognized by the Navy since the war, and after the sad experience of the first few pioneer squadrons in the field, which in spite of a lack of facilities managed to give a good account of themselves, the Navy has now established and is in the process of fitting out no less than 20 bases in the Pacific for PT boats. These bases will be completely fitted out with all manner of equipment for the care of PT boats and their personnel. In addition, about 10 large Motor Torpedo Boat tenders have been designated and are fitting out, which will permit having mobile advanced PT bases from an advanced base. This will facilitate moving PT's with their tender in to any occupied area with the first landing groups and permit the PT's to operate offensively and defensively and be partially serviced before their main base equipment and supplies are moved up. It is expected that the PT's will, like the Marines, be the first to the fronts.

The necessity for specialized personnel training has also been recognized. Success in Motor Torpedo Boat operations depends upon extremes in training, alertness, and intelligence on the part of operating personnel. Courage, daring, stealth, deception and surprise are important elements favorable to success. For this reason there was established, on March 16, 1942 by the Secretary of the Navy, the Motor Torpedo Boat Squadrons Base and Training Center in Narragansett Bay at a cost of over two million dollars. Here about 800 enlisted men and 110 officers are constantly under training for Motor Torpedo Boat operations, upkeep and maintenance, in a



two months' course of practical instruction. The officers and men assigned for instruction are specially selected, all volunteers, and between the ages of 20 and 34 years. Each month from the graduating class, a certain number of officers and men are selected for immediate assignment to the squadrons in the combat areas to relieve and replace deserving personnel who are ordered back to the Training Center to act as instructors or to be assigned as a nucleus of experienced personnel to new squadrons fitting out. The remainder of the graduating classes are assigned to new squadrons going in commission.

In view of the PT boat being one of our newest naval weapons, their full potentialities have not yet been fully exploited. There will undoubtedly be many offensive and defensive possibilities arise for them, in future operations.

The boats usually operate in divisions of three in a "V" or echelon formation. In the combat areas they seldom operate alone as several together provide mutual support in case of engagements with aircraft or surface vessels.

At night they hunt at low speeds to reduce the engine noise and more important to reduce the wake, which at higher speeds is visible at great distances. They are fitted with mufflers which are quite effective up to speeds of about 18 knots. Experiments have been conducted to black out the wakes at higher speeds, but as yet the weight of equipment and material required is excessive and would reduce the speed too much. Upon sighting the enemy at night, they attempt to close the range and gain a favorable position for firing torpedoes without being detected. The doctrine is to fire torpedoes at ranges inside of 1000 yards. When the range has been closed, the boat is given full throttle, further closes the range, and fires torpedoes. If illuminated by the enemy during this time machine gun fire is directed at searchlight and superstructure. If pursued by the enemy, the launching of a depth charge or two, or laying smoke is often effective in throwing him off. Voice radio communication is used between boats, however, at night, follow the leader tactics are employed as much as possible. SLIDE #13

If large numbers of boats are employed at night, they are separated into divisions of three and given sectors or areas in which to operate or attack, in order not to interfere or collide with each other. A division of three boats makes an excellent attack unit, it is wieldy and maneuverable. More than that number in an attack unit, usually results in confusion. The division leader leads the boats in and when directed to attack, individual boats act independently.

The normal Motor Torpedo Boat Squadron consists of 12 boats and a complement of 28 officers and 184 enlisted personnel. Besides the boat crews, each squadron has additional personnel for base administration, maintenance, overhaul and upkeep. Despite efforts to improve conditions for Motor Torpedo Boat personnel, they are required to endure considerable hardships. There is a crew's compartment forward capable of billeting 8 men, and two small staterooms for officers. There is a small galley and ice box. Boats

can operate away from tender or base efficiently for about 48 hours for which full rations are carried, emergency rations carried permit subsistence for a day or two longer. Under choppy sea conditions sleeping or cooking on board is almost impossible and in combat areas, where speed is vitally important all excess equipment such as bunks, cooking gear, etc., is removed in order to cut down the weight and help increase the speed. Sandwiches and vacuum jugs of coffee, usually provide all the sustenance when boats are operating on a mission. In enemy waters where contact is likely, crews are usually too keyed up to eat much, and very seldom desire to go below to sleep.

Considerable glamorous publicity, unsought by most of the operating personnel has given the impression that our Motor Torpedo Boats made such fantastical speeds as 60-70 miles an hours. Certainly craft can, and have been constructed capable of making these speeds, but the sea keeping qualities and the armament carried would be so greatly sacrificed that operations could be conducted only under the most ideal and special conditions. Our present boats are a compromise, between speed, seaworthiness, armament and self sustaining. They have many limitations such as a very low height of eye and range of visibility, unstable gun platforms, vulnerability to strafing and dive bombing aircraft, limitations in heavy rough seas. Their main defensive power lies in small size, speed, maneuverability, ability to lay smoke and cruise silently at low speeds.

Consideration has been given to the construction of Motor Torpedo Boat Carriers which would be capable of launching and recovering Motor Torpedo Boats at sea while operating with the Fleet. While this idea is quite practicable and feasible, interest has somewhat waned since the latest boats have grown in size and weight from about 25 tons and 58 feet long to 55 tons and 80 feet in length. The demand for the present boats and mobile tenders for them, also the fact that by the time a suitable carrier could be designed, constructed and tested, the war might be over, has distracted attention which might have been centered on a carrier.

The gradual increase in size of the present Motor Torpedo Boat and the increased armament proposed for it in the future, indicates a repetition of a cycle in warship construction. It is quite possible that our present Motor Torpedo Boat is gradually growing into another destroyer, with the present destroyer growing into a cruiser - and the little 44 foot, two man semi-submersible torpedo boat previously described, taking the place of the Motor Torpedo Boat.

## ACCOMPLISHMENTS

On December 7, 1941, we had two squadrons in the Pacific -- one at Pearl Harbor and one in the Philippine Islands. When Japan struck her treacherous blow at Pearl Harbor, Squadron ONE consisting of twelve boats, half of which were loaded on a fleet tanker, was pressed into immediate action. Squadron ONE, were the first United States Motor Torpedo Boats to engage in enemy action and were credited with shooting down three Japanese planes. They were in constant demand for several months after the 7th for inshore anti-submarine patrol and were the only vessels available that could drop depth charges in the shallow restricted waters of the harbor and channel where enemy midget submarines were lurking, and get clear before the charges exploded. This they did day and night for several months. In view of the constant reports of Japanese midget submarine activity in and around Pearl Harbor (many of which were false), and the fact that one or two midget submarines did gain access to the harbor, the presence of the Motor Torpedo Boats and their anti-submarine operations were very reassuring to authorities concerned. These PT's possibly accounted for two enemy submarines. This Squadron later went to Midway from Pearl Harbor under their own power and in September 1942, took part in the defense of that Island.

The accomplishments of Squadron THREE in the Philippines which under the command of Lieutenant John D. Bulkeley, U.S.N., are generally known, having already become an historical part of the first battle of the Philippines. A resume is given below:

The first major exploit of this Squadron was an attack on a Japanese auxiliary cruiser in Subic Bay. This hard pushed night attack resulted in the Cruiser being sunk beneath the oily waters of Subic Bay.

The second memorable accomplishment of Motor Torpedo Boat Squadron THREE was the sinking of a Japanese 6000 ton auxiliary aircraft carrier. (This was a daring raid dodging through an inferno of lead from shore batteries and through treacherous nets).

One night while patrolling in the darkness of a tropical storm near Corregidor, an armed landing barge was sighted, attacked and sunk. The barge and fifty troops, apparently bent on landing off the coast of Bataan, were destroyed. Two hours later while on the same patrol, another landing barge was sighted and destroyed. From this barge two prisoners -- a Captain and a private plus papers and dispatches were taken, which proved of considerable value to American forces. A few days later this squadron scored again by bagging three Japanese dive bombers.

The PT's soon took off on another tour of destruction. This time it was an attack on a 6000 ton Japanese cruiser. The boats were illuminated by searchlights and strong gun-fire was directed on them, yet the PT's again came through in fine style by torpedoing this cruiser. The next day this Cruiser was found beached, and it was later borken up for scrap.

## ACCOMPLISHMENTS

SLIDE \*14

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Further accomplishment for the Squadron was an act of mercy. When the S.S. CORREGIDOR loaded with 1200 persons was sunk by a mine in the mined channels near Corregidor Island, the PT's were the only vessels that came to the rescue. Dodging across the mine fields at the risk of sudden death, the PT's picked up survivors and carried them safely on to Corregidor. Over 105 survivors were loaded on board one PT boat at one time.

There was also the hazardous evacuation of General MacArthur and his party. This proved to be a difficult task for the Squadron, yet it was successful. Proceeding through heavy seas running twenty feet high into enemy controlled waters was an accomplishment that will long be remembered.

A few weeks later Manuel Quezon, President of the Commonwealth of the Philippines, was evacuated by a Motor Torpedo Boat attached to Squadron THREE. This episode, too, was packed with narrow escapes from the time the boats left Negros Island until they returned to Mindanao.

Perhaps one of the most important operations of Squadron THREE was the torpedoing and sinking of a light cruiser of the Kuma Class. Receiving word that a Japanese Cruiser escorted by destroyers was heading for Cebu, two PT's set out for a night attack on the enemy force. Near midnight the force was sighted and the enemy was closed to decisive range. One boat commanded by Bulkeley drew the fire of the Cruiser so that the other commanded by Lieutenant Kelly, U.S.N., could get in its shots. Bulkeley's torpedoes failed to hit but Kelly managed to hit the Cruiser's magazine so she went down by the stern in less than twenty minutes, but the fight was not over as the escorting destroyers gave chase and only good fortune saved the first boat. Kelly was not quite as fortunate for dive bombers caught up with him next morning in a narrow river where he could not maneuver. He shot down one of the attacking dive bombers but the other plane's gun-fire proved too much for the plywood boat. Kelly was forced to beach and destroy his boat after many of the crew members were injured or dead. All six boats of this squadron were finally destroyed by their own personnel to keep them from falling into enemy hands. This was after they had taken a tremendous toll of enemy ships and lives.

Japanese night operations in the Solomon Islands created a great demand for PT boats in that theatre. Motor Torpedo Boat Squadron TWO in Panama, consisting of 14 Elco 77 foot boats and augmented by 6 new Elco 80 foot boats, was divided into two squadrons -- Squadron TWO and a new Squadron THREE -- and shipped to that area where they finally arrived at Tulagi Harbor and participated in their first battle on October 13, 1942.

Prior to the arrival of the PT boats, heavy and light Japanese surface ships made almost routine nocturnal excursions from their Northern Bases, landed troops and supplies on the Japanese held portion of the Island and then mercilessly shelled the American Marine positions near Henderson Air Field.

Except for uncharted coral reefs and the lack of base maintenance and overhaul facilities, the area was ideal for PT boat operations and they proceeded to inflict much damage on enemy vessels. The following is a brief summary of their activities to date which it is considered were highly important contributing factors in permitting our forces to take over complete control of Guadalcanal at a later date.

On October 13, 1942, Japanese Cruisers and Destroyers came in to shell Henderson Field under cover of darkness. Four PT's then on patrol attacked at 500 yards and scored two hits on a Japanese cruiser, after which the bombardment ceased and the Japanese retired. PT's were pursued by Japanese Destroyers but suffered no losses.

On the 29th of October, two Japanese Destroyers were reported to be near Cape Esperance. Two PT's patrolling near Savo Island intercepted the destroyers and made one sure torpedo hit.

November 8, 1942, aircraft reconnaissance revealed that five destroyers were heading down toward Esperance from the North-West. Three Motor Torpedo Boats patrolling between Savo and Esperance sighted the destroyers close aboard heading south at about 30 knots. The PT's attacked at a range of about 1000 yards and made one sure torpedo hit, however, the boats were caught in a heavy three way cross-fire and one PT had its bow shot away. It is of interest that despite this, the damaged PT was able to make port on its own power, and also that The Motor Torpedo Boat Tender JAMES-TOWN improvised a new plywood bow and this particular boat was soon in action again.

On November 10th, three PT's were patrolling south-west of Savo when they sighted four destroyers in column close to the shore. Contact was then lost in a dark background. The PT's headed in the direction that the destroyers were last observed to be steaming. The destroyers illuminated the PT's and opened fire. This forced the PT's to fire their torpedoes at 1000 yards range. One torpedo hit was claimed by the PT's.

On November 13th, five PT's were on their way to a rendezvous off Savo Island when one section of two boats sighted enemy destroyers. In all, eight torpedoes were fired at a rather long range. Results were not observed as the boats were recalled immediately and ordered to intercept Japanese ships coming in to shell Henderson Field. The PT's intercepted and at a range of 1200 yards, one PT fired three torpedoes at a large warship (probably a battleship), and one hit was observed. Another PT fired two torpedoes at a destroyer and made one hit. The most important result was that the Japanese were forced to cease shelling and retired.

On December 7th, four PT's standing an alert patrol, sighted five destroyers screening a large ship. The PT's fired in all 14 torpedoes making two sure hits and two additional probable hits. The Japanese forces was dispersed and contact lost.

On December 9th, two PT's on patrol near Kaminbo Bay sighted a submarine on the surface. As the boats turned to attack, the

submarine was observed to submerge and as it did the PT's picked up a Japanese landing boat close aboard. The PT's opened fire on the landing boat with machine guns and 20 m/m and while this was going on, one of them observed the submarine emerge and fired two torpedoes at it. One torpedo made a direct hit amidships which completely destroyed the submarine.

On December 11th, eight Japanese destroyers were sighted by patrolling torpedo boats. In the surprise attack that followed, torpedo hits were scored on three of the destroyers.

On January 11, 1943, PT's on patrol sighted a force of seven destroyers coming in to land troops and supplies. In the hard contested engagement that followed the Japanese lost one destroyer for certain and another severely damaged by torpedo hits. Two torpedo boats were destroyed in this engagement, one by fire and one by beaching, however, many of the crew were saved. The following morning the PT's destroyed great quantities of stores and supplies which the Japanese Destroyers had tried to float into the beach.

On January 28th, the Japanese attempted to land stores by sending destroyers in near the shore line at high speed to drop tanks of food and supplies, hoping that the tanks would float ashore. The PT's drove the destroyers away and with the aid of our planes destroyed the supplies by machine gun fire.

Only the first of February Motor Torpedo Boats engaged an enemy force of 20 destroyers somewhere near Guadalcanal. At least one destroyer was sunk, two others were torpedoed and believed to have been sunk. The entire force was turned away. Our losses were 3 PT boats.

Thus far the PT Squadrons in the Solomons have sunk or damaged an estimated 300,000 tons of enemy vessels including a battleship or heavy cruiser, two cruisers, sixteen destroyers and one submarine with a loss of only 10 boats of which some of the crews were saved.

A steady stream of PT boats are now enroute to various areas in the Pacific. Since the arrival of the first squadrons at Tulagi, on October 13, 1942, many new boats of a later design have arrived, with many others on the way. Thus the previously insignificant step-children of our Navy are gradually winning their rightful recognition as a necessary and important arm of our service. When the final pages of history of Naval Seapower in the Pacific are written, it is highly certain that our Motor Torpedo Boats will have contributed their proportionate share.

