National Register of Historic Places Registration Form

This form is for use in nominating or requesting determinations of eligibility for individual properties or districts. See instructions in *Guidelines* for Completing National Register Forms (National Register Bulletin 16). Complete each item by marking "x" in the appropriate box or by entering the requested information. If an item does not apply to the property being documented, enter "N/A" for "not applicable." For functions, styles, materials, and areas of significance, enter only the categories and subcategories listed in the instructions. For additional space use continuation sheets (Form 10-900a). Type all entries.

1. Name of Property			
historic name U-505 (TX C U-Boa	ıt)		
other names/site number CAN DO J	UNIOR		
2. Location			not for publication
street & number Jackson Park city, town Chicago			vicinity
	017 county C	look code 031	zip code
State TITTHOTS	OI7 GGO.N.		2.5 0000
3. Classification			
Ownership of Property	Category of Property	Number of Resou	rces within Property
X private	building(s)	Contributing	Noncontributing
public-locai	district		buildings
public-State	site		sites
public-Federai	X structure	1	structures
	Object		objects
		1	Total
Name of related multiple property listing	j :	Number of contril	outing resources previously
N/A	**********		nal Register0
4. State/Federal Agency Certificat	Plan		
4. State/Federal Agency Certifical	HOII		
In my opinion, the property meets	does not meet the f	National Register criteria. See c	ontinuation sheet. Date
State or Federal agency and bureau			
in my opinion, the property meets	does not meet the f	National Register criteria. See c	ontinuation sheet.
Signature of commenting or other official			Date
State or Federal agency and bureau			
5. National Park Service Certification	tion		
I, hereby, certify that this property is:			
entered in the National Register.			
See continuation sheet.			
determined eligible for the National			
Register. See continuation sheet.			
determined not eligible for the			
National Register.			
removed from the National Register.			
other, (explain:)			
		Signature of the Keeper	Date of Action

B. Function or Use			
Historic Functions (enter categories from instructions)	Current Functions (enter categories from instructions)		
DEFENSENaval Facility	RECREATIO	N AND CULTURE- Museum	
7. Description			
Architectural Classification enter categories from Instructions)	Materials (enter categories from instructions)		
	foundation	N/A	
N/A		/ .	
	roof	N/A	
	other	N/A	

Describe present and historic physical appearance.

 $\underline{\text{U-505}}$ is one of only two remaining examples, not on the ocean bottom, of an operational German U-boat, the weapon which most threatened the United States and its allies in World War II during the Battle of the Atlantic. She is also the only surviving naval prize vessel captured on the high seas by the United States Navy. Today $\underline{\text{U-505}}$ is on permanent exhibit at the Museum of Science and Industry in Chicago and is open to the public for self-guided tours.

U-505 as Built and Modified

U-505 is the only remaining example of 156 Type IX C German U-Boats built from 1940 to the 1944. [1] Type IX C U-boats were large, long-range boats intended for commerce raiding in distant U-505 was built as hull 295 by the Deutsche Werft Shipyard in Hamburg, Germany. Begun June 2, 1940, and commissioned August 26, 1941, U-505 was 76.4 meters long, 6.8 meters in beam, 4.7 meters in depth and displaced 1120 tons on the surface and 1540 tons submerged. [2] Her pressure hull was capable of diving safely to below 600 feet and is enclosed in a faired outer hull with a raking bow, wide, flat deck and generally streamlined outer surface. This double hull design added greatly to the submarine's range both by increasing reserve buoyancy (which left less hull surface to push through the water) and by giving more room between the hulls for additional fuel Stability was increased by building 90 tons of ballast into an external keel running along the center of U-505's The two-level conning tower is mounted aft of It is the only major hull structure that presents considerable resistance to submerged propulsion. As the boat was primarily intended to operate on the surface, increased submerged resistance was not considered too great a handicap.

8. Statement of Significance Certifying official has considered the significance of this pr	roperty in relation to other properties:	
Applicable National Register Criteria XA BX		, 7
Criteria Considerations (Exceptions)	C D DE F XG	
Areas of Significance (enter categories from instructions) Military Maritime History Engineering	1940-1947 1940-1947	gnificant Dates 941, 1944 940, 1944 940, 1944
NHL VIII A: World War II; War in Europe, Africa, and the Atlantic, 1939-1945 NHL VIII D: World War II; The Home Front	N/A	
Significant Person N/A	Architect/Builder Deutsches Werft Shipyard, Hamb	urg, Germany

State significance of property, and justify criteria, criteria considerations, and areas and periods of significance noted above.

SIGNIFICANCE

The Second World War war prize submarine U-505 is the first foreign warship captured on the high seas by the United States Navy since 1815. Damaged, boarded and captured off Cape Blanco in French West Africa, U-505 was brought to the United States where she provided valuable intelligence information about German equipment and codes. Fleet Admiral Ernest J. King called this the "most unique and dramatic incident" of the U. S. antisubmarine war in the Atlantic. After study by the U.S. Navy, she made a tour of U.S. Atlantic and Gulf coast ports to support the War Bond drive before being left dormant for nine years at the Portsmouth Navy Yard in Portsmouth, New Hampshire. obtained by the Museum of Science and Industry in Chicago, Illinois. On September 25, 1954, Admiral William F. Halsey dedicated the vessel to serve as a memorial to the 55,000 Americans who lost their lives at sea in the Second World War. [1]

The preceding statement of significance is based on the more detailed statement that follows.

9. Major Bibliographical References	
See footnotes in text.	
see Toothotes In text.	
	V Con continuation short
Previous documentation on file (NPS):	X See continuation sheet
preliminary determination of individual listing (36 CFR 67)	Primary location of additional data:
has been requested previously listed in the National Register	State historic preservation office Other State agency
previously determined eligible by the National Register	X Federal agency
designated a National Historic Landmark recorded by Historic American Buildings	Local government University
Survey #	Other
recorded by Historic American Engineering Record #	Specify repository: US Naval Historical Center
1100014 #	National Archives
10. Geographical Data	
Acreage of propertyLess than one acre	
UTM References A 1 8 3 2 6 8 2 0 4 3 0 4 2 0 0	
A 1 8 3 2 6 8 2 0 4 3 0 4 2 0 0 Northing	B Zone Easting Northing
c	
	See continuation sheet
Verbal Boundary Description	
All that area encompassed within the extrem vessel.	e length and breadth of the
vessel.	
	See continuation sheet
Boundary Justification	
The boundary encompasses the entire area of at the museum.	the vessel as she rests
	See continuation sheet
11. Form Prepared By	
name/title <u>Kevin J. Foster</u> organizationNational Park Service (418)	date11January1989
street & number P.O. Box 37127	telephone (202) 3/(3-9508
city or town Washington,	state DC zip code 20013

National Register of Historic Places Continuation Sheet

Section number .	7	Page	2
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Propulsion

Like most submarines of her day, U-505 was powered by a combination of Diesel and electric propulsion. A pair of Diesel (compression-ignition) engines each drives an electric dynomotor which can be used either to turn the screw propellers through clutches directly or used to charge the huge lead-acid storage batteries to provide power for submerged propulsion later. four-cycle, nine-cylinder Diesel engine produced 2170 horsepower to drive the 493 HP dynomotors to propel U-505 at up to 7.3 knots submerged, or 18.5 knots on the surface. [4] The Diesel engines need a great deal of air to operate and thus can only be used while the boat is surfaced. U-505 was not fitted with a snorkel to allow her to run the Diesel engines while submerged as were many newer U-boats. [5] The Diesel engines or the electric dynomotors drove twin screw propellers beneath the overhanging torpedo tubes and stern. The stern diving planes are mounted just behind the propellers. Twin rudders extend down from the hull behind the stern planes. The forward diving planes extend out to port and starboard from the bow. [6]

Weapons

U-boats were built to carry torpedoes as their primary weapon. They used their deck guns only in rare instances to fight airplanes when unable to submerge or to sink small or crippled vessels without wasting a torpedo. U-505 has four 530-mm torpedo tubes mounted in her bow and two in her stern. Boats of U-505's class could carry a total, including reloads, of either 66 mines or 22 torpedoes. These tubes used compressed air to eject the torpedoes or mines from the hull from whence they sped toward a target or lurked on the bottom awaiting a hapless target. [7]

When commissioned, <u>U-505</u> mounted a large deck gun of 10.5-cm but as anti-submarine aircraft became more dangerous to submarines. this was removed and more anti-aircraft guns added. The anti-aircraft guns were a single 37 mm automatic cannon with an armored shield on the lower gundeck aft of the conning tower and a 20 mm automatic cannon mounted at each wing of the upper gun deck. [8]

Belowdecks U-505 is divided into eight compartments. Beginning at the bow, four 530 mm torpedo tubes are mounted behind shutters

National Register of Historic Places Continuation Sheet

Section	number		Page	_3
---------	--------	--	------	----

with their after ends protruding through the pressure hull into the forward torpedo room. This room held reload torpedoes, torpedo handling gear and crew berths. Immediatly aft are the petty officer's and chief's quarters and the tiny galley to port and the captain's cabin to starboard of the escape trunk through the deck above. The officers' wardroom and the radio and sound rooms are aft of the galley. Aft of the radio and sound rooms and beneath the tallest portion of the conning tower is the control room. The periscopes and trunk leading up into the conning tower occupy the middle of the space while the plotting table, helmsmans' position, planesmen, and water ballast controls are along the sides of the compartment. Aft of the control room is the Diesel engine room which houses the two Diesel engines to port and starboard. The manuevering room which houses the two electric dynomotors, clutches connecting the propeller shafts, the dynomotors, and all electric controls is aft of the diesel engine room. The aftermost compartment in the boat is the after It contains two 530 mm torpedo tubes, reload torpedo room. torpedoes, and berths for part of the crew. Compartments forward of the engine room are on two levels with the huge storage batteries mounted beneath removable floor plates.

U-505's PRESENT APPEARANCE

After $\underline{\text{U-505}}$ was captured she was partially dissassembled for study and then was slightly modified to enable a U.S. Navy crew to operate her. [10] Most of these modifications were removed when the boat was installed in her permanent dry berth in Chicago. The hull of $\underline{\text{U-505}}$ is mounted on a concrete foundation. The hull is anchored at the center and is supported on rollers at the bow and stern to allow for expansion and contraction due to temperature variations. Visitors enter the starboard side of the hull aft through access doors cut in the pressure hull, proceed through the boat, and exit at the bow through another doorway cut in the hull. [11]

National Register of Historic Places Continuation Sheet

Section number __7__ Page __4___

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National Register of Historic Places Continuation Sheet

Section number	88	Page	2
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Prize Vessels And The U.S. Navy

The doctrine of the right of capture grows from the basic idea of "To the victor belong the spoils" and is probably as ancient as war itself. At sea this idea and the ethics from which it grew have been formalized into a class of law known as prize law. Much of modern international prize law has grown out of captures involving vessels of the United States.

During the Revolutionary War, the Quasi-War with France, and the War of 1812, the Navy of the United States captured several foreign naval vessels and condemned, sold, or converted them for use in the U.S. Navy. This practice followed ancient tradition and particularly that of the Royal Navy of Britain. The last such vessel captured was H.M. Brig Penguin, captured by the United States Sloop-of-War Hornet March 23, 1815, off Tristan Da Cunha. [2]

During the Civil War both the United States and the Confederate States Navies captured enemy warships but not one was captured on the high seas. Non-warships such as pirates, slavers, smugglers, and blockade runners have been and continue to be captured to this day but the only foreign warship captured at sea by boarding by the U.S Navy since 1815 is U-505. [3]

The Development of the U-Boat And Modern Commerce Warfare

Guerre de Course or warfare against commerce, has evolved over time as have the concepts of what is ethical and what is not ethical when diplomacy is replaced by force of arms. During the First World War new weapon systems stretched the concepts of what is ethical behavior in wartime. The most prominent of these was the use of submarines carrying automobile torpedoes or marine mines to be used against commercial vessels in unrestricted warfare. Commerce raiding by submarines was so effective that it assumed a greater role as a form of economic blockade. Great damage was directly inflicted on the merchant and war fleets of Great Britain, the United States, and their allies and indirectly to the entire war effort. This new method of warfare against vessels previously protected by long standing treaties and tradition was a major reason for the entry of the United States into that conflict. [4]

National Register of Historic Places Continuation Sheet

Section	number	8	Page	3
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The war also brought improvements in technology while it forced reevaluation of ethics and maritime law. The technology of submarines and that of their hunters improved quickly and the effectiveness of submarines was clearly proven.

Development of the Long Range Type IX C U-Boat

Following World War I, submarines were forbidden to the losers to avoid a repetition of the carnage in any future conflict. This prohibition held good until the early 1930s when Germany secretly began to build small training unterseeboots or U-boats. Gradually the boats were built bigger and were at first overlooked and later allowed to Germany by other maritime nations. [5] By the beginning of the Second World War three basic types of U-boats were in use. These were: a small training submarine of 250 tons (the Type II), an austere 500-ton attack submarine intended for use in the North Sea and around Great Britain (the Type VII), and a large 750-ton submarine intended for use in the distant waters of the North and South Atlantic and even in the Indian Ocean (the Type IX). [6]

Type IX U-boats were built from 1940 to the end of the war with several major variants and continual improvements in design and fittings. The German Navy built 210 of these long range, cruising submarines in six variants. Several changes in design improved features of the basic type producing the Type IX A, Type IX B, and finally the Type IX C. Variants on the type designed for greater range produced the extra long range Type IX C/40 raiding boats and the Type IX D blockade running boats designed for trade with Japan. The largest group was the IX C variant of which 156 were built. U-505 was one of this group. [7]

The Development of Anti-Submarine Forces

The advances in technology which made submarines dangerous weapons also found their counterpart in the technology used to counter them. During the First World War several new devices, vessel types, and tactics allowed some success against submarines. The development of hydrophones allowed sounds produced by submarines to be heard by surface ships. Explosive devices set to explode at various depths beneath the water surface, called depth charges, were used to breach the hulls of submerged submarines. Aircraft were used to spot submerged U-

National Register of Historic Places Continuation Sheet

Section numbe	r <u>8</u>	Page	4
---------------	------------	------	---

boats for destruction by surface ships. Special escort vessels were built to protect other more valuable ships. Specially camouflaged warships called Q-ships masqueraded as peaceful merchantmen and lured U-boats close to their guns. The ancient idea of convoy, where a few escorts protected many ships against attack, was resurrected. [8]

Between the wars, improvements in technology produced new means of finding submarines. One of these was a type of sound detection device called Sonar. Sonar uses beams of sound produced by a surface ship to bounce off a submarine to give its position even when the submarine is quiet. Other detection devices located submarines by the changes they produced in the earth's magnetic field (proton precession magnetometers) or by triangulating on the radio transmissions made by submarines (HF/DF). Radar was also developed between the wars and perfected in the early years of the Second World War. Radar uses radio beams to bounce off of a target and locate it much as sonar uses sound beams. Radar allowed surfaced submarines to be located before they could be visually picked out. [9]

New weapons for destroying submarines when located were also developed. Depth charges were made more effective and made able to be spread in a wide pattern by dropping them over stern rails and firing them to each side with K- and Y- guns. Small rocket propelled explosive charges called hedgehogs and mousetraps could be fired ahead of the escort vessel in a pattern to explode if they hit a submarine.

Airplanes grew in size and gained the ability to fly far out over the sea lanes to spot and sink or harass submarines. Even these new long range patrol planes could not reach the center of the Atlantic. This area was made safer when small aircraft carriers called escort or "jeep" carriers were built that could carry small patrol planes. With the advent of "jeep" carriers, U-boats had no safe haven in the North Atlantic. The combination of "jeep" carriers and specialized anti-submarine destroyer escorts in hunter-killer groups allowed the fight against U-boats to switch to the offense. Submarines were actively sought out rather than encountered only when they attacked and revealed themselves.

National Register of Historic Places Continuation Sheet

Section	number	8	Page	5
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Construction and Career of U-505

The keel of <u>U-505</u> was laid down at the Deutsches Werft Shipyards in Hamburg, Germany, on June 2, 1940. The future sea raider was given hull number 295 and was built as one of the 156 Type IX C submarines. Construction took more than a year in spite of the top priority of resources being given to U-boat building. On August 26, 1941, the completed submarine was commissioned as <u>U-505</u> at Hamburg, Captain Axel Loewe, commanding.

On September 1, 1941, $\underline{\text{U-505}}$ transited the Kiel canal to the Baltic Sea for training and shakedown exercises. This period lasted four-and one-half months. On November 24, the boat passed her operational trials and after her post trial refit and loading of live torpedoes, $\underline{\text{U-505}}$ joined the Second U-boat Flotilla at Lorient, France, in January 1942.

On February 11, 1942, $\underline{\text{U-505}}$ departed on her first war patrol off of Freetown, Sierra Leone. She sank 4 ships; 2 British, 1 Dutch, and 1 American for a total of 26,000 tons, and returned to Lorient on May 7.

The second war patrol of U-505 began on June 7, 1942, when she departed from Lorient for the Caribbean. The shipping lanes along the American coast soon after the U.S. declaration of war were poorly defended and offered many targets. On this cruise the boat sank two American freighters and a Brazilian schooner but Captain Loewe got sick and the submarine had to return to port early. U-505 arrived back in Lorient on August 25. [10]

Captain Loewe was detached to have his appendix removed and replaced by Captain Lieutenant Cszhech. During her refit to prepare for the next patrol, a "Metox" radar detector was installed to give warning that the sub had been detected by Allied radar to allow her time to dive and escape attack.

Captain Czschech took $\underline{\text{U-505}}$ out from Lorient on October 4, 1942, bound again for the Caribbean. He patroled off Trinidad and sank one ship on November 7, but this cruise was also cut short when, on November 10, she was sighted by an airplane and bombed. One bomb hit behind the conning tower and tore a huge hole in the

National Register of Historic Places Continuation Sheet

Section number	8	Page	6
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outer hull and destroyed the anti-aircraft platforms. The pressure hull was intact but the port engine was put out of commission and many pipes had to be rerouted due to damage. After considerable work, the damage was cleared away and the boat made able to submerge. On the return voyage spare parts, medical supplies, and help were obtained from other U-boats. U-505 returned to Lorient on December 12, 1942. Repair of the damage and improvements in equipment took six months to complete in the submarine pens at Lorient.

On July 1, 1943, <u>U-505</u> sailed again but defects forced her back into port later that day. On her next attempt to get to sea she was damaged by depth charges dropped by an airplane and forced to return to port again on July 14 to have sound and metox gear repaired. Sabotage by French workers had damaged gaskets in valves and had allowed a small leak of fuel oil that had given her position away. Damage by sabotage forced <u>U-505</u> to return to port several more times that month and it was not until November 10 that she was able to creep out into the Bay of Biscay on her fourth war patrol.

The fourth war patrol began with an extremely cautious exit from the Bay of Biscay. On November 24 <u>U-505</u> was subjected to a furious depth charge attack, and Captain Czschech could not cope with the stress of command and committed suicide in the conning tower. The executive officer saved the boat through skillful manuever and use of the <u>pillenwerfer</u> chemical sonar decoy bubble and returned to Lorient. [11]

Oberleutnant Harold Lange took command of $\underline{U-505}$ on November 18, 1943, and took her to sea on December 25 for her fifth war patrol. While still in the Bay of Biscay $\underline{U-505}$ rescued the survivors of $\underline{T-25}$, a small German destroyer sunk earlier that night. While in port at Brest to land the survivors, a fire burned out one of the electric motors and she was forced into a shipyard there for 10 weeks of repairs.

 $\underline{U-505}$ sailed on her sixth war patrol on March 16, 1944, bound for Freetown. This voyage did not turn up any targets and on May 24 $\underline{U-505}$ departed Cape Palmas on the African coast to return home to France. Instead she met a different fate.

National Register of Historic Places Continuation Sheet

Section number	8	Page	7
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Capture of U-505

A U.S. Navy hunter-killer task group made up of the escort carrier USS <u>Guadalcanal</u> and destroyer escorts USS <u>Chatelain</u>, <u>Flaherty</u>, <u>Pope</u>, and <u>Pillsbury</u> tracked illusory signs that a U-boat was moving north along the African coast. Task Group 21.12 commander, Captain Daniel V. Gallery had prepared his task group to capture a U-boat by boarding if an opportunity should present itself.

 $\underline{U-505}$ came to periscope depth when her sound man picked up propeller noises. Captain Lange popped the periscope up and spotted three destroyers and several planes headed for him and U-505 stayed shallow for the first, most dangerous attack, manuevered to evade the sonar beams, and released a pillenwerfer sonar decoy. The destroyers fired hedgehogs at the decoy, missed, and then laid an accurate depth charge pattern over the sub. Multiple explosions jammed the rudder hard to starboard, rolled U-505 on her side, and breached the stern torpedo room. With water rushing into the stern, Lange ordered the boat to surface, abandon ship, and scuttle the boat. Lange was the first out the hatch when U-505 surfaced, was wounded, and knocked unconcious. The crew lifted the captain into a rubber boat and escaped into the water or into rubber boats with only one casualty.

For the Americans everything went according to plan. When the U-boat was forced to the surface the destroyer escorts Pillsbury, Jenks, and Chatelain fired small arms at her to encourage the crew to abandon ship. U-505 was still moving in a circle at six knots with her rudder jammed hard over when the last of the Germans went over the side. A boarding party in a motor whaler, led by Lieutenant Albert David from Pillsbury, leapt on deck and rushed for the conning tower hatch. The boarding party first secured the code books and passed them up on deck in case they should lose the prize and began searching for scuttling charges, open sea cocks, and booby traps. The crew working inside the submarine were forced to close the hatch because of the trim condition of the boat; seas were washing in and threatening to sink the sub.

National Register of Historic Places Continuation Sheet

Section	number	8	Page	8
---------	--------	---	------	---

A second technical party, including a skilled ships engineer arrived after the first and began working to save the prize. Thirteen of fourteen five-pound TNT scuttling charges were found and disarmed and the U-boat was eventually taken under tow and freed of water.

It was found that the only ship in the task group that could tow U-505 was the carrier <u>Guadalcanal</u>. She towed the submarine prize for four days while carrying out air operations until she was met by the fleet tug <u>Abnaki</u> which took over the tow to Bermuda. On June 19, 1944, the task group arrived at Bermuda with their prize. The crew of U-505 was imprisoned there in a special camp and all personnel of the task force were enjoined to the strictest secrecy so that no news of the capture would leak out. Task group 21.12 was awarded a Presidential Unit Citation for the meritorious conduct in the capture of U-505. This award remained classified until after the end of the war. [12]

The capture of $\underline{U-505}$ yielded considerable information about the technology used in building U-boats. $\underline{U-505}$ was the only Type IX captured by the Allies. British anti-submarine forces had captured two of the smaller Type VII boats, one which had destroyed all secret equipment before the British took possession and another from which some secret equipment was recovered before she sank. Intelligence concerning the larger Type IX submarines was needed by the United States, as these were the type most likely to be encountered in American waters. [13]

Most important in the capture was the full set of charts, codebooks, "Enigma" coding machine with extra parts, and copies of decoded old messages showing code groups on one side and clear copy on the other. This provided a valuable check on other intelligence gathered earlier and allowed the Allies to read German messages with confidence in the accuracy of their decryption. [14]

During the study of $\underline{U-505}$ by Allied technical experts at Bermuda and in the United States the submarine was put in condition to sail under her own power. It appears that she was not commissioned as a U.S. Navy vessel but was operated as part of

National Register of Historic Places Continuation Sheet

Section	number	88	Page	9
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the "Special Submarine Group," Submarine Base, New London, Connecticut, under Lt. Horace B. Mann in technical trials under the code name "Nemo." When Germany surrendered she was taken on a tour of the Atlantic and Gulf coasts by an American crew to promote the selling of War Bonds. Following the surrender of Japan, U-505 was tied up at the Portsmouth Navy Yard, Portsmouth, New Hampshire, and left there for nine years. No decision was made as to her disposition during this time.

The United States, along with the other Allied nations received several former German U-boats as reparations at the end of the war. These were mostly of the final most advanced types of U-boat and were obtained for study. The agreement which awarded these vessels to the various nations also required that after two years all such reparation vessels were to be scuttled or scrapped. U-505 was not subject to this agreement and when the other ex-Kriegsmarine U-boats were scuttled, she continued to rust in dock at Portsmouth. [15]

U-505 and Chicago

The Museum of Science and Industry in Chicago, Illinois, had sought a submarine for exhibit since 1926 and began a project to bring $\underline{U-505}$ to the museum in 1948. Ownership of the vessel was sought from the Navy Department, and considerable support led to the Congressional approval of transfer of title. [16]

The submarine was made seaworthy and towed through the St. Lawrence River, Welland Canal, and the Great Lakes to Chicago in May and June 1954. <u>U-505</u> spent six weeks preparing for her haulout at Calumet Harbor. To prepare her, the keel ballast was removed, a cradle was built for the hull, and she was placed in a floating drydock. A channel was dredged to the shore and a pier built out to meet it for the transfer of U-505. On August 13, 1954, the submarine was gently slid ashore and on September 3 she was moved into position where she now rests outside the museum. The official dedication took place on September 25, 1954. Godfrey, a popular entertainer, was master of ceremonies and Admiral Halsey gave the principal address in dedicating U-505 to the 55,000 Americans who lost their lives at sea in World War II. [17]

National Register of Historic Places Continuation Sheet

Section numbe	r <u> 8 </u>	Page _	10
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- John R. Spears, <u>The History of Our Navy: Fromits Origin To the End Of the War With Spain</u>, 1775-1989 (New York: Charles Scribner, Sons, 1899) pp. 273-282.
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- Jak P. Mallman Showell, <u>U-Boats Under The Swastika</u> (New York: Arco Publishing Company, 1973) pp. 92-95.
- Norman Friedman, <u>Submarine Design And Development</u> (Annapolis, Maryland: Naval Institute Press, 1984) pp. 42-46 and Mallman Showell, <u>op.cit.</u>, pp. 105-106.

National Register of Historic Places Continuation Sheet

Section number 8 Page 11

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