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From: Chief, Naval Technical Mission to Japan.
To : Chief of Naval Operations.
Subject: Target Report - Tenth Military Experimental Station.
Reference: (a) "Intelligence Targets Japan" (DNI) of 4 Sept. 1945.

1. Subject report, outlined by Target S-93(N) of Fascicle S-1 of reference (a), is submitted herewith.

2. The investigation of the target and the target report were accomplished by Comdr. V.R. Hayes, USN, and Comdr. P.E. Greenwood, USN.



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S-93(N)

**TENTH MILITARY EXPERIMENTAL STATION
MUROTSU, HONSHU, JAPAN**

**"INTELLIGENCE TARGETS JAPAN" (DNI) OF 4 SEPT. 1945
FASCICLE S-1, TARGET S-93(N)**

JANUARY 1946

U.S. NAVAL TECHNICAL MISSION TO JAPAN

SUMMARY

SHIP AND RELATED TARGETS

TENTH MILITARY EXPERIMENTAL STATION MUROTSU, HONSHU, JAPAN

The Tenth Military Experimental Station was an army establishment for the investigation of problems dealing with marine attack, supply and defense. Enclosures (B) and (C) are translations of the indexes to its reports, showing the various projects upon which it was working. The majority of these were routine problems related to small supply ships, escort and attack ships, and marine engines. These reports have not been translated, but can be found in the original documents listed in Enclosure (A). There were, however, some projects which appeared to be of special interest and it is with these that this report deals. These projects were concerned with suicide craft, midget submarines and beach defenses. Of particular interest among the beach defenses is the submersible gun mount of which three types were developed.

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REFERENCES

Location of Target:

Tenth Military Experimental Station, MUROTSU, Honshu, Japan.

Japanese Personnel Interviewed:

Col. KAMIO - In charge of research on ships over 1000 tons, landing craft tenders, tank-carrying ships and submersible gun mounts.

Lt. Col. OTA - Marine engines, escort vessels.

*Maj. NAKAMURA - Submarine engines.

Maj. UEDA - Procurement and administration.

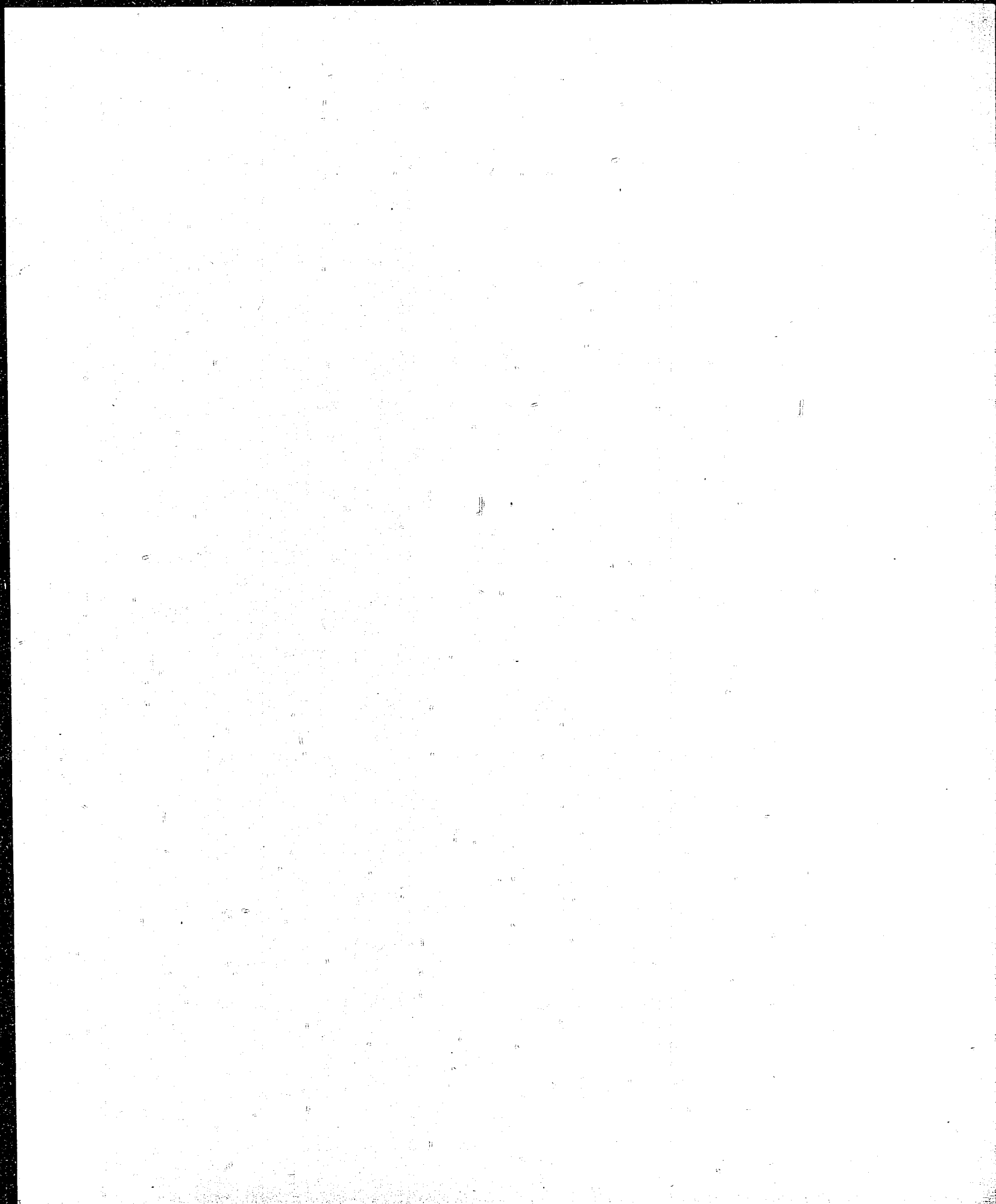
LIST OF ENCLOSURES

- (A) List of Documents Forwarded to the Bureau of Ships.
- (B) Index to the 1944 Research Report (Translation).
- (C) Index to the 1945 Research Report (Translation).
- (D) Report #6-45: Small Close Assault Submarines.
- (E) Report #14-45: Propeller Fouling Obstacles.
- (F) Report #17-45: Semi-Submersible Attack Craft.
- (G) Report #24-45: Underwater-Concealed Surfacing Mines.
- (H) Report #29-45: Submersible Gun Mount, Model 1.
- (I) Report #30-45: Rocket Accelerated Suicide Boat.
- (J) Report #33-45: Submersible Gun Mount, Model 3.
- (K) Report #34-45: Submersible Gun Mount, Model 2.

INTRODUCTION

The Tenth Military Experimental Station is an example of the lack of close cooperation between the Japanese Army and Navy. With one or two possible exceptions, the problems under investigation were ones that the United States would consider to come properly under the province of the Navy. The station was established late in the war and had very little in the way of facilities and equipment. Much of the test equipment and many of the instruments were borrowed from other activities as required. The main office and drafting room were established in a girl's school at HIMEJI. Experiments were carried out near MUROTSU (about 20 kilometers from HIMEJI), where a private house was used as an office and a private warehouse as a storage space.

The following report deals with the projects investigated which appeared to be of the most interest. Blueprint drawings of the equipment will be found at the end of each section in the original documents (See Enclosure A).



THE REPORT

I. SUICIDE AND ATTACK CRAFT.

Many devices were studied by the Tenth Military Experimental Station during its brief existence in spite of a shortage of facilities and equipment. Among those studied were small cargo ships and cargo submarines. These were developed by the Army because it transported materiel in its own or in requisitioned ships. The development of escort vessels and submarine chasers indicates that they did not have sufficient protection from the Japanese Navy. The experiments carried on to convert engines for marine use and to convert marine engines for the use of ersatz fuel are of interest.

Of greater interest are the various "sneak attack" craft and beach defenses. The small close assault submarine (See Enclosure D) is a cross between the Navy's midget submarine and the human torpedo. The engine, shafting and propellers are the same as those used in the Mark 98 torpedo (hydrogen peroxide type). It was manned by one man and armed with two simple torpedoes. The torpedoes had not been chosen, but it was expected that these would be small rocket-propelled torpedoes without a steering mechanism. Although not a suicide craft, it is doubtful that the submarine would survive, due to the close range at which such a torpedo would have to be fired.

The semi-submersible attack boat (See Enclosure F) is a curious craft designed to run almost submerged in order to avoid detection. It could be used either to launch torpedoes or as a suicide boat. An unusual feature is the rudder, which consists of a cylinder completely enclosing the propeller. The Japanese report that this rudder was very effective. The practicability of this type of craft is doubtful due to its low freeboard and speed.

The rocket-accelerated suicide boat (See Enclosure I) was under development to give very high speed during the last stages of the attack. Due to difficulties with the rockets, the experiment had not been completed. Similar studies were carried out by the Navy without practical results. A report of these can be found in NavTechJap Report, "Japanese Suicide Craft", Index No. S-02.

II. BEACH DEFENSES.

One type of beach defense consisted of fish nets and ropes suspended under the water on floats which were to entangle the propellers of our landing craft and reduce their speed. (See Enclosure E). Another beach defense consisted of mines planted on the sea bottom on platforms. (See Enclosure G). On the day of a landing, these were surfaced by means of trip lines. Vanes attached to the mines dispersed the group on each platform over a wider area.

Another weapon to be used in the defense of beaches was the submersible gun mount (See Enclosures H, J and K). It was to rise in the midst of our landing craft and do as much damage as possible with its light gun. The first model was not mobile and the submerging operation was hand-powered. Oxygen generators, air purifiers and air suppliers were provided to sustain two men for 48 hours. The armament consisted of a 37mm gun with 60 rounds of ammunition or a 20mm gun with 200 rounds. The second model was somewhat larger and was self-propelled. Provision was made to sustain a four-man crew for 48 hours. A 75mm gun was mounted and 30 rounds of ammunition were provided. The third model was also self-propelled and was to act in conjunction with the other two. It carried a five-man crew. It was to act as a communication and supply ship for the other models and also carried 115 five-kilogram mines which were to be released during the landing. It mounted no gun.

ENCLOSURE (A)

LIST OF DOCUMENTS FORWARDED TO THE BUREAU OF SHIPS

<u>NavTechJap No.</u>	<u>Title</u>	<u>ATIS No.</u>
ND50 - 1217	Report of investigations carried on by Tenth Military Institute during 1944.	3281
ND50 - 1215	Report of investigations on marine engines, supply ships, escort vessels, suicide craft, submersible gun mounts, landing craft etc.	3280

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ENCLOSURE (B)

INDEX TO THE 1944 RESEARCH REPORT OF THE TENTH MILITARY EXPERIMENTAL STATION

<u>No.</u>	<u>Date</u>	<u>Subject</u>
1	4 September	Report on Submarine Chaser (KUCHIKUTETI), Model 2
2	4 September	Report on Small High Speed Supply Ship, Model 1
3	13 October	Intermediate Report on Research on Concealment and Dummies (Camouflage of Small Craft)
4	14 October	Intermediate Report on Studies of Liaison Craft (TN: for Suicide Crashes)
5	18 October	Report on Studies Made to Recover Personnel of Suicide Craft (Special Life Jacket)
6	21 October	Report on Studies on Fire Fighting Equipment for Small Craft
7	28 October	Report on Research on Large Wooden Landing Barge, Part 1 (with ROKE Engine Marine Adaptation)
8	3 November	Report on Studies on Emergency Marine Conversion of Engines
9	3 November	Report on Studies of Experimental 130 HP Diesel Engine
10	6 November	Intermediate Report on Studies of Small Supply Ships
11	15 December	Report on Studies of Small Escort Ships

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12	15 December	Report on Studies of Submarine Chaser (KUCHIKUTEI), Model 4
13	16 December	Report on Studies on Cutting up Large Steel Landing Barges (to Simplify Transport)
14	17 December	Report on Research on Large Wooden Landing Barge. Part 2 (Prefabricated Wooden Barge)

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ENCLOSURE (C)

INDEX TO THE 1945 RESEARCH REPORT OF THE TENTH MILITARY EXPERIMENTAL STATION

<u>No.</u>	<u>Date</u>	<u>Subject</u>
1	5 January	Report on Studies of Small Supply Ship, Model 3
2	8 January	Report on Studies on Experimental 120 HP Diesel Engine
3	11 January	Report on Studies to Improve Performance of Transport Submarines
4	23 January	Report on Studies on Special Ships, Part 1 (MKO Model 1 for Loading Landing Barges)
5	3 February	Report on Studies on Special Ships, Part 2 (MKO Model 2 for Loading Landing Barges)
6	6 February	Report on Studies on Small Close Assault Submarines
7	11 February	Report on Studies on Reinforcing Large Landing Barges Made of Plywood
8	17 February	Report on Studies on Large Wooden Landing Barges, Part 3
9	21 February	Report on Studies on Prefabricated Type Large Steel Landing Barges
10	22 February	Report on Studies on High Speed Small Supply Ships, Model 2
11	26 March	Report on Studies on Large Landing Barge
12	4 April	Report on Studies on Special Ships, Part 3 (MHE 1 Model 1 for Loading Barges and Use as Auxiliary Carrier)
13	12 April	Report on Studies on Large Wooden Landing Barges, Part 4

14	23 April	Report of Studies on Propeller Fouling Material and Equipment With Which Such Material May Be Quickly Disposed. (TN: For Use Against Enemy Landing Barges)
15	23 April	Report on Studies of One-Place Landing Barges, Part 1 (Manually Powered)
16	26 April	Report on Studies of Methods of Transporting Liaison Craft (Suicide Craft) on Trucks
17	7 May	Report on Studies of Semi-submerged Close Attack Craft
18	11 May	Report of Studies on Installation of 20cm Rocket Launchers on Large Landing Barges
19	21 May	Report on Studies of Large Wooden Landing Barges, Part 5 (Studies on Large Plywood Landing Barges, Model 2)
20	30 May	Report on Studies of 30 HP Semi Diesel Engine
21	5 June	Report on Studies of One-Place Landing Barges, Part 2 (Engine Powered)
22	7 June	Report on Studies of Equipment for Rapid Loading and Unloading of Ships, Part 1 (Studies on Conveyor Belt for Ship Use)
23	14 June	Report on Studies on Conversion of Marine Engines to Utilize Ersatz Fuel (Part 1, Studies of Conversion of 60 HP Diesel Engine to Utilize Charcoal Gas)
24	30 June	Report of Studies on Free Underwater Concealed Mines
25	30 June	Report of Studies of Large Wooden Escort Craft, Part 1
26	30 June	Report on Studies of Large Wooden Escort Craft, Part 2
27	2 July	Report on Studies of Liaison Craft and Model KO (3) 1 Capable of Launching Torpedoes
28	2 July	Report on Studies of Liaison Craft Model KO2 Craft Equipped with Rocket Launcher
29	7 July	Report on Studies of Special Submersible Gun Mount, Part 1. (Studies on Special Submersible Gun Mount, Model 1)
30	11 July	Report on Studies on Liaison Craft Model BO 1 (With Rocket Propulsion)
31	13 July	Report on Studies of Methods of Loading Transport Submarines
32	7 August	Report of Studies of Small Escort Craft

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33	13 August	Report of Studies of Special Submersible Gun Mounts, Part 2 (Model 3)
34	14 August	Report of Studies on Special Submersible Gun Mounts, Part 3 (Model 2)

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ENCLOSURE (D)

SMALL CLOSE ASSAULT SUBMARINES
Report #6-45 (Translation)

A. Motive for Study

Following the issuance of Army Ordnance Administration Headquarters Secret Technical Bulletin #1685, studies were initiated on a craft which could close in submerged to very short distance of enemy ships and launch torpedoes.

B. Conclusions Based on Results and Recommended Future Work

1. Conclusion

It is felt that this submarine generally lives up to expectations and can be adopted for practical use.

2. Future Work

Experimental results should be compiled to serve as a basis for coordinated Army-Navy Experiments.

C. Outline of Study

1. Initiation of Study

Following the directive of the technical bulletin, basic studies on this craft were begun toward the end of September, 1944.

2. Designs

Work on plans and specifications were begun during the beginning of October, 1945 and completed about the middle of November, 1945.

3. Experimental Model

a. Plants

Kawasaki Vehicle Co., Ltd. - Hull and fittings.
Shinko Armament Industries, Ltd., OGAKI plant (Adaptation of main power unit.)

b. Log of construction of experimental model

End of October, 1944 - construction begun.
25 December, 1944 - main power units mounted.
8 January, 1945 - experimental model completed.

4. Experiments

a. From 8 December, 1944, to 20 December, 1944, fuel and horsepower test with special liquid fuel were conducted at the test grounds of the OGAKI plant, Shinko Armament Industries, Ltd. From these results the following can be inferred:

"Special liquid fuel can be used expeditiously as the motivating fuel for small close assault submarines. Moreover, its combustion efficiency is considered good enough to warrant practical use."

b. Trial runs were conducted in KOBE Harbor from 9 January to 21 January 1945 from which results the following may be inferred:

"Although several structural modifications are necessary, its performance generally lives up to expectations and it is considered suitable for practical use. There is still a need, however, to await the designation of the torpedo to be used to make studies on torpedo firing equipment."

5. Improvements

Based on the results of the tests up through the latter part of January, 1945, as mentioned in the proceeding paragraphs, necessary improvements in plans have been made.

6. End of Study

With the publication of "Items Concerning Maintenance of Transport Submarines," in the early part of February, 1945, the necessary basis for carrying out joint Army and Navy research and research on similar small craft was obtained. Research on this craft completed the study.

D. Description of Small Close Assault Submarine

1. Purpose, Use

This is designed to be a small close assault submarine capable of approaching enemy ships to very close distances while submerged to deliver torpedo attacks.

2. General Subdivisions

This is a single-shell submarine utilizing special liquid fuel.

a. Hull

The hull consists of the shell, steering mechanism, towing mechanism, and torpedo mechanism for firing simple (KAN-I) torpedoes.

(1) Shell

The shell is made of steel plates and consists of six compartments, forward compartment, #1 fluid tank, central compartment (includes central buoyancy chamber, reserve tank, control room), fresh water tanks, engine room, and aft compartment. These compartments are coupled by cast steel welded rings and the various chambers and tanks are partitioned by bulkheads.

(2) Steering Mechanism

The steering mechanism consists of the vertical rudder, horizontal rudder and fins.

The vertical rudder is a manually operated device controlled by the steering gear located in the control room which operates the vertical rudder lever in the stern. The sections where the controls pass through bulkheads and shell are watertight. A compass is installed for navigational purposes. The horizontal rudder is an automatic device controlled by the depth and diving mechanisms, located in the control room which operate the diving rudder lever located aft. The fins consist of the vertical, horizontal, and diagonal fins and are mounted outside the aft compartment.

(3) Towing Mechanism

A collapsible type towing ring is mounted on the upper surface of the forward compartment.

(4) Simple Torpedo Firing Mechanism

Two simple torpedo tubes are mounted on both sides of the hull. The construction is such that both can be fired simultaneously with a firing handle located in the control room.

b. Engine Section

The engine section consists of the main power unit, combustion chamber, engine valves, speed-regulating mechanisms, fuel and lubricating oil systems, and compressed air equipment.

(1) Main Power Unit

The main power unit is a horizontal, two-cylinder, double-action engine, whose performance is as follows: 1000 rpm; 300 HP.

(2) Combustion Chamber

The combustion chamber is provided with outlet valves for the #1 fluid, #2 fluid, fuel, and fresh water (Four each for low speed and high speed). By reacting the four liquids that are forced in, gas is generated to drive the engine.

(3) Engine Valves and Speed-Regulating Mechanism

The engine valve and speed-regulating mechanism retard or advance flow of the four liquids to the combustion chamber, thereby regulating rate of flow resulting in control of the movement and speed of the craft.

(4) Fuel and Lubricating Oil Systems

The fuel and lubricating oil systems consist of the following named tanks plus necessary gauges, tubes, valves, and cocks. The systems are actuated by air pressure reduced to 25 Kg/cm².

(a) #1 Tank; 700-liters (Is a part of the shell, the inner surface being coated with tin solder to which a layer of sheet tin 2mm thick is fixed.)

(b) #2 Tank; 75-liters (Mounted within the reserve buoyancy chamber, the inner surface being coated with solder.)

(c) Fuel Tank; 90-liters (Mounted within reserve buoyancy chamber.)

(d) Fresh Water Tank; 700-liters (Is also part of shell.)

(e) Lubricating Oil Tank (2); 65-liters each (Mounted within reserve tank.)

(5) Propeller Shaft Assembly

Consists of the main shaft and four blade contrarotary propellers.

The main shaft consists of two concentric hollow-core shafts which contrarotate by a gear arrangement. The hollow core also serves as exhaust duct.

Dimensions of the propeller are as follows:

	Forward screw	Aft screw
Diameter	0.540 in.	0.500 in.
Pitch	0.700 in.	0.700 in.
Diameter of Base	0.132 in.	0.104 in.
Rotation	clockwise	counter-clockwise

Propeller shape: The blade cross-section is a streamline pattern at the blade stubs and gradually changes to an arc at the blade tips. The blade shape is lanceolate.

(6) Compressed Air System

The compressed air system consists of the air reservoir and regulator plus necessary gauges, tubes, valves and coils. The air reservoir is mounted inside the fresh water tank. It has a capacity of 621-liters and 150 Kg/cm² pressure. The regulator adjusts pressure to 25 Kg/cm².

c. Electrical Section

This section consists of the electric power source and electrical instruments.

(1) Power Sources

A 12-volt, 60-ampere-hour array of batteries is placed in the control room as power supply for illumination, power for the compass pump (TN: probably vacuum pump operating gyro compass) and circulating pumps.

(2) Electrical Equipment

There is a 1/2 HP intake-exhaust pump and illuminating equipment.

3. Properties

Calories per kilogram 1550
Gas temperature approx. 4000°C
Usable temperature range 400C to - 500C

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ENCLOSURE (E)

PROPELLER-FOULING OBSTACLES
Report #14-45 (translated)A. Motive for Study

Following directives of Army Ordnance Administration Secret Technical Bulletin #118, 29 January, 1945, studies were initiated on (1) obstacles to foul propellers of landing craft thereby reducing their performance and (2) equipment with which these obstacles could be rapidly set in place.

B. Description of Propeller-Fouling Obstacles1. Purpose, Use

These obstacles are used to entangle and thereby reduce the efficiency of propellers of landing craft.

2. Construction and Performancea. Construction(1) Using Large-Mesh Fish Nets

Connecting ropes (one meter lengths of old hemp string or scraw rope) and sufficient floats (commercial fish net floats of pawlonia wood or bamboo cut to one node length sections) are spaced at 50 centimeter to 1 meter intervals above the nets to hold them parallel to surface. The terminals are anchored.

(2) Using Small-Mesh Fish Nets

Thirty centimeter square holes are cut at 50 centimeter intervals. The same type of rigging described in the preceding plan is used to hold net parallel to surface and both terminals are secured.

(3) Using Straw-Rope

A net is made of straw rope. Ropes, one meter in length are bound to each knot, and this assembly is suspended parallel to surface. Both terminals are secured.

3. Standard Dimensions

		Length	Width	Mesh	Cord size	Weight*
Fish nets	large mesh	20m	5m	30cm square	6mm	30 metric tons
	small mesh**	10m	6m	30cm square	2mm	40 metric tons
Straw rope		20m	5m	50cm square	2mm	35 metric tons

*Weight does not include weight of floats.

**When small-mesh fish nets are used, double loops are used.

C. Setting Out Obstacles

The nets are placed on platforms constructed of wood, bamboo, etc., extending beyond both gunwhales (pieces placed about 45° diagonally with reference to axis of craft) of a large landing barge and are pushed overboard and set in place manually.

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ENCLOSURE (F)

SEMI-SUBMERSIBLE ATTACK CRAFT
Report #17-45 (Translation)

A. Motive for Study

As a project for September, 1944, studies were initiated on a small craft capable of concealed approaches to enemy vessels in order to deliver torpedo or depth charge attacks.

B. Description of Semi-Submersible Attack Craft1. Purpose, Use

This is a semi-submersible craft which is capable of making concealed approaches very close to enemy vessels and attacking said vessels with torpedoes or explosives. It is of mixed wood-iron construction.

2. Construction and Performance

This craft consists of the hull, engine section, armament, accessories, and spare parts. The overall plan is shown in attached chart Number 1.

a. Hull and Fittings

The hull and fittings consist of the shell, steering mechanism, hoisting gear, mooring gear, towing gear, ventilation system, and observation ports.

(1) Shell

The central section is made of steel while the forward and aft sections are made of wood. The steel section is a watertight cylinder consisting of outer plate, reinforcing ribs, forward and aft bulkheads. There is an engine mount on the inner deck, a manhole on the top. The forward and aft bulkheads are removable. The wooden sections are made up of the outer plates, ribs, and longitudinal stringers and are of simple, non-watertight construction. The steel and wooden sections are coupled with bolts.

(2) Steering Mechanism

By turning the steering wheel mounted on the steel section, the rudder at the stern is controlled by action of the control cables. The control cables pass through the conning tower to the outside. The rudder is a cylindrical rudder made of steel plates. It is framed in place by the rudder post and envelope the propeller, thereby protecting the propeller. Control cables are fastened to both sides of the forward edge of the rudder.

(3) Hoisting, Mooring, and Towing Gear

There are four hoisting rings on the top side of the steel section, one mooring fitting on both forward and aft wooden sections, and one towing fitting on both the steel and forward wooden sections.

(4) Ventilation System

This consists of the intake pipe, water trap, and exhaust pipe. The air drawn in through the intake is separated at the trap from any salt water that may come in simultaneously and circulated throughout the inside.

(5) Observation Ports

Observation ports are placed on both the sides and front of the conning tower.

b. Engine Section

This section comprises a main power unit, propeller shaft assembly, various tubes and tanks, and electrical equipment.

(1) Main Power Unit

There is a 60 HP diesel engine with an electric starter motor and charging generator as accessories.

(2) Propeller Shaft Assembly

This consists of the propeller shaft, shaft bearing, stern tube, and propeller and serves to transmit engine power to propeller. The propeller shaft is broken into three sections by a universal coupling and shaft coupling. The shaft is held in place by the watertight bearing in the aft bulkhead of the steel sections.

(3) Tubes and Piping

These are the fuel lines, coolant lines, air exhaust pipes, and water exhaust pipes.

(4) Tanks

They include the four tanks given as follows plus necessary tubes, pumps, valves, and cocks.

Buoyancy tank	250 liters	Forward wooden section
Buoyancy tank	350 liters	Aft wooden section
Fuel tank	500 liters	Steel section
Water trap	150 liters	Steel section

Filling or exhausting the buoyancy tanks with salt water, determines semi-submerged or normal afloat attitudes.

(5) Electrical Equipment

This includes power sources, electric lights, and distribution lines. The power source is four batteries (6-V, 140-ampere-hour). The lights are two portable electric lights. All this equipment is located within the steel section.

c. Armament

One torpedo, either an explosive-propelled, simple type or a 45 centimeter electric-propelled type, is placed on either gunwhale or approximately one metric ton of explosive is placed in the forward wooden section. When the need arises, a concealed signal set (FUKASHI SHINGOKI-TN: Possibly a small radio) is placed near the pilot seat.

d. Essential Data

Model/type	half submersible, wood-iron construction
Overall length	10.000 meters
Maximum beam	1.550 meters
Net weight	4.000 metric tons
Average draught - Half submerged	1.500 meters
Afloat	1.200 meters
Speed (half submerged)	
Maximum - with torpedoes	7 knots
without torpedoes	8 knots
Cruising - with torpedoes	5 knots
without torpedoes	6 knots
Endurance	30 hours
Engine	one 60 HP diesel
Armament	explosive-propelled, simple torpedo; 45 centimeter electrically-propelled torpedo; or about one metric ton explosive.
Signal set	one (concealed) when necessary
Crew	two men

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ENCLOSURE (G)

UNDERWATER, CONCEALED SURFACING MINES
Report #24-45 (Translation)A. Motive for Study

As a project for April 1945, studies were initiated on mines which are originally sown underwater but which later surface.

B. Description of Mine-Surfacing Gear and Minelaying Gear1. Purpose, Use

These are first planted underwater but later float up and destroy enemy landing craft in waters close to shore.

2. General Construction and Performance

a. Underwater Concealed Surfacing Mine

This mine has a surfacing directional characteristic of about 35° and by the action of the surfacing gear can be made to float to the surface.

b. Surfacing gear

This is a wood-steel frame with removable weights on the underside and to which six underwater concealed surfacing mines are attached. By means of a special disengaging device all six mines are released simultaneously.

c. Minelaying Gear

This is a manually operated crane mounted on a large landing barge and used to set surfacing gear in water.

3. Essential Data

a. Underwater Concealed Surfacing Mine

Type	Overall Height	Outer Diameter	Weight		Surfacing*		
			Total	Explosive	Reserve	Rate	Directional Characteristic
A	83cm	30cm	36kg	15kg	3.0kg	0.4 ^m /sec	35°
B	73cm	22cm	17kg	5kg	1.5kg	0.4 ^m /sec	35°

*Wooden directional fins 40cm wide and 55cm long are mounted to stabilize directional characteristic of surfacing.

b. Surfacing Gear (all figures approximate)

Height			Width	Weight		
Frame	Removable Weights	Overall		Frame	Removable Weights	Overall
0.2m	1m	about 1.2m	1.60m	40kg	50kg	90kg

c. Minelaying Gear

Derrick post (king post)		Derrick arm		Capacity
Height	Diameter	Length	Diameter	
7m	20cm	4m	17cm	0.5 metric tons

C. General Description of Minelaying Process

Surfacing gear complete with mine is successively laid using the derrick arrangement.

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ENCLOSURE (H)

SUBMERSIBLE GUN MOUNT, MODEL 1
Report #29-45 (Translation)

A. Motive for Study

Following directives of Army Ordnance Administration Headquarters Secret Technical Bulletin #118, 29 January 1945, studies were initiated on special gun mounts capable of being elevated from underwater positions to expedite exploitation of fire power.

B. Description of Submersible Gun Mount, Model 11. Purpose, Use.

These gun mounts are placed underwater at localities where enemy forces may be expected to land and to emerge at unexpected moments to fire on enemy landing craft.

2. Construction and Performance

This gun mount can be loaded on railroad cars or made buoyant for towing in water. The mount consists of the mount proper, necessary armament, accessories and spares. The overall plan is given in the attached chart.

a. Mount Proper

This consists of pressure-tight shell, flooding and pumping gear, anchor gear, electrical equipment, and living aids.

(1) The pressure-tight shell is a round, steel chamber to the outside of which are attached buoyancy tanks, anchor and anchor chain bar, ballast chambers, and forward and aft streamlining sections (removable). In the inside is a regulating tank.

(2) The flooding and pumping gear consist of air bleed valve, manually operated pump, air tank and vent valve. Flooding is accomplished simply by letting water flow in. Water is removed from the regulating tanks by the hand pump and from the buoyancy tanks by compressed air.

(3) Anchor gear includes anchors (or weights) chains, and anchor-raising gear. This operation is manually controlled from within the pressure-tight chamber.

(4) Electrical equipment includes batteries (four 6 volt, 120 ampere-hour) and necessary distribution lines. This equipment is used to illuminate the insides of the pressure-tight chamber and operate the oxygen generator.

(5) Living aids include hammocks, oxygen generator, air purifier, fresh water tank, food locker, and toilet facilities. The joint use of the oxygen generator and air purifier can sustain two men for 48 hours and there is enough food and fresh water to last two men one week.

b. Armament

Consists of one gun and ammunition. The gun is either a Type 4, 37mm shipborne gun or a special Type 98, 20mm AA automatic cannon and is placed on top of the pressure-tight chamber. Sixty rounds in case of the 37mm gun or 200 rounds in case of the 20mm gun are stored within the pressure-tight chamber.

c. Essential Data

Overall length	4.080 meters
Overall width	2.490 meters
Overall height	3.400 meters
Diameter of pressure-tight chamber	1.890 meters
Height of pressure-tight chamber.....	2.200 meters
Displacement	7.000 metric tons
Armament	one Type 4, 37mm shipborne gun, or special Type 98, 20mm AA automatic cannon.
Submersible depth	30 meters
Continuous submerged endurance	48 hours
Surfacing time	40 to 45 seconds
Submerging time	30 to 35 seconds
Crew	two men

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ENCLOSURE (I)

ROCKET ACCELERATED SUICIDE BOAT
Report #30-45 (Translation)

A. Motive for Study

Following directions of Army Ordnance Administration Secret Bulletin 90, 4 May, 1945, studies were initiated on a liaison craft equipped with rockets to accelerate the craft when the need arises.

B. Description of Liaison Craft Model BO 1.

1. Purpose

This is a liaison craft equipped with a rocket tube which is used for accelerating speed when the need arises.

2. Construction and Performance

This craft consists of the hull, engine section, rocket equipment, armament, accessories, and spare parts. The overall diagram is given in the attached chart.

a. Hull and Fittings

This consists of the shell, steering gear, hoisting gear, towing and mooring fittings, and deck installations. The shell is made of wood with the keel, stringers, etc. of keyaki wood (TN: according to dictionary, a type of Zelkova tree), ribs of straight-grained wood, and decks, outer plates, etc. of waterproof plywood. This speed boat is a model. The steering gear, towing and mooring fittings, and deck installations are all of simple, light construction. The steering gear includes a direct controlled rudder and a simple rudder locking device.

b. Engine Section

This consists of the main power unit, propeller shaft assembly, control gear, electrical gear, fuel tank, various tubes, etc.

(1) The main power unit is either a marine conversion of either a Toyoda automobile engine, Model KC; or Nissan automobile engine, Model 180.

(2) The propeller shaft assembly consists of the transmission gears, universal coupling, thrust bearing, propeller shaft, stern tube, strut bearing, and propeller. The speed changing assembly is the one ordinarily used with the Toyoda, Model KC; or the Nissan, Model 180.

(3) Control gear consists of the clutch pedal, gear shift lever, throttle lever, tachometer, and oil pressure gauge which are all located in the control cockpit.

(4) The electrical items include switches, starter button, ammeter, battery, and distribution lines. The instruments are the same as used on the automobiles.

(5) The fuel tank has a capacity of about 100-liters and is mounted below deck behind the cockpit.

(6) Cooling tubes, fuel lines, and exhaust piping make up the various piping systems. The cooling system includes the sea water intake valve, cooling pump, cooling lines, and cooling exhaust fitting. The fuel lines assembly consists of the lines and coupling to exhaust.

c. Rocket Assembly

This is an array of eight 13mm powder-relay type rocket tubes installed on the stern. These are fired electrically and controlled from the cockpit. The rocket tubes are portable in order to facilitate changing tubes.

3. The experimental construction was begun at the NAGASAKI factory of Mitsubishi Heavy Industries Co. Ltd., and completed in mid-July.

4. Practical experiment on this pill box was carried out in outer NAGASAKI Harbor from 19 July to 9 August, 1945. The following conclusions were reached (No. 41 of 10th Technical Research): It is necessary to modify in part the construction of the Model 3 Submersible Pill Box. However, it is believed possible to obtain necessary satisfactory performance.

5. In accordance with the previous experiment, necessary modifications in design were made and completed in mid-August 1945.

D. General Outline of Model 3 Submersible Pill Box

1. Object and Use

The pill boxes are located in waters where an enemy landing is expected. Enemy landing craft are attacked by releasing mines which are attached to the outside of the submerged pill box.

This pill box can perform functions of supply and communication in the water for Model 1 and 2 Submersible Pill Boxes.

2. General Description of Construction and Function

This pill box is the horizontal, steel-cylinder type and can be transported on a railway freight car. It consists of a hull section, engine section, electric section, armament, attached parts and spare parts.

a. Hull Section

The hull section consists of hull, steering gear, flooding and blowing apparatus, ventilating apparatus, mine-launching gear, operating and navigating gear, and living quarters.

(1) The steel hull is horizontal and cylindrical in shape and capable of withstanding a pressure of six atmospheres. In the bottom of the hull there are supply and regulating tanks. On the underside of the hull there are a ballast keel, wave-cutting sheet, elevator and mine-launching gear.

(2) The steering gear consists of horizontal, vertical and diving rudders and is controlled manually from the bow cockpit.

(3) The flooding and blowing apparatus consists of a high pressure pump, a low pressure pump, necessary valves, flooding and blowing pipes, and air vent tube. Flooding is accomplished by gravity. Blowing is done by a high pressure pump in the regulator tanks and by a low pressure pump in the supply tank. It is equipped with one high pressure pump for emergency use.

(4) The ventilating gear consists of an air vent, air intake and exhaust vent and ventilating cut-off valve.

(5) The mine-launching gear is a mechanism which releases, to float secretly in the water, the mines which it has carried on the mine-launching platform.

(6) The control gear is installed in the bow section of the hull and is used when the pill box is submerged.

(7) The navigation gear consists of compass, depth indicator and inclinometer.

(8) In the living quarters are oxygen generator, air conditioner, fresh water tanks, provision locker and toilet.

b. Engine Section

The engine section consists of a main engine, auxiliary machinery shafting and piping.

(1) The main engine is a 60 HP diesel (for movement on the surface of the water).

(2) The auxiliary machinery consists of a high pressure pump, low pressure pump (for flooding and blowing), high pressure hand pump (for emergencies), blower (for ventilation), and gear pump (for lubrication).

(3) Shafting consists of shaft couplings, propeller shaft, stern tube, stern shaft bearing and propeller.

(4) Piping consists of water cooling, fuel oil, lubricating oil and exhaust systems. There are four fuel tanks (capacity 55 liters) which are installed on both sides of the engine room.

c. Electrical Section

Electric equipment consists of a main electric motor, storage batteries, lighting equipment, communication gear and electric switchboard.

(1) There are two 8.5 HP DC electric motors (for running submerged).

(2) Each storage battery consists of 40 cells and two 160-V, 600-ampere-hour batteries connected in parallel. These batteries are the source of power for all electric motors, lighting and communication gear.

d. Equipment

Equipment consists of mines which float secretly in the water, radio and periscope.

(1) The mines, which float secretly in the water, are 115 in number, with an explosive charge of 5 kilograms each and are carried on the upper part of the pressure hull.

(2) The radio is a vehicular radio B and is installed in the after part of the cockpit.

(3) The height of the periscope is 3.5 meters and it is installed aft of the hatch tower.

3. Essential Data

Crew five men
 Overall length 13.4 meters
 Overall width 2.04 meters
 Overall height 3.45 meters
 Displacement - surfaced 36 metric tons
 submerged 40 metric tons
 Engines - diesel one 60 HP
 electric two 8.5 HP 160V DC motors
 Speed - surfaced 5.5 knots
 submerged 2.5 knots
 Range - surfaced 50 nautical miles
 submerged 30 nautical miles
 Submerging depth 50 meters
 Maximum submerged period 48 hours
 Armament 115 underwater mines
 Vehicular radio B one
 Periscope one

E. Classification of Ordnance - Military Top Secret (GUNJI GOKUHI)F. In Charge of Research

Section Head - Colonel Motoo KAMIO
 Principals - Major (Tech.) Yoshito NAGAHATA
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ENCLOSURE (K)

SUBMERSIBLE GUN MOUNT, MODEL 2
 Report #34-45 (Translation)

A. Introduction

In accordance with the provisions of Ordnance Administration Headquarters Technical Secret Order No. 118, dated 29 January, 1945, research was undertaken on a submersible pill box which develops its own motive power and which can surface from the sea at will. This research was continued under the provisions of Order No. 90, dated 4 May, 1945.

B. Conclusions and Future Measures Based on the Experiment Results1. Conclusions

In general the Model 2 Submersible Pill Box is practicable and its performance is satisfactory.

2. Future Measures

Ordnance blueprints are being prepared for the Model 2 Submersible Pill Box.

C. Chronology of Research

1. Date of commencement: 1 May, 1945.
2. Date of completion: Mid-June, 1945.
3. Experimental construction was commenced in mid-June and completed in mid-July at the Tamano Shipbuilding Works, Mitsui Ship Building Co. Ltd., TAMANO, Okayama Ken.
4. Practical experiments on the submersible pill box were carried out at NAOSHIMA and at the Tamano Shipbuilding Works harbor and the following conclusion may be stated:

The model 2 Submersible Pill Box cannot surface quickly and its performance in this respect is unsatisfactory. Improvements must, therefore, be made and further performance tests conducted.
5. In accordance with the requirements of previous experiments, improvements on the Model 2 Submersible Pill Box were undertaken in the last part of July, 1945 and were completed in the first part of August, 1945.
6. Practical experiments of the Model 2 Submersible Pill Box were carried out a second time in the Tamano Shipbuilding Works harbor and off KATSURAJIMA on 8 August, 1945 and the following conclusion may be stated: The performance of the improved Model 2 Submersible Pill Box is in general satisfactory and the pill box may be put into practical use.
7. In accordance with the requirements of previous experiments, necessary changes in the blueprints were made and the research was completed in mid-August of 1945.

D. The Model 2 Submersible Pill Box1. Function

The submersible pill box operates in the sea where enemy landings are anticipated. It surfaces quickly and attacks enemy landing boats.

2. Construction and Performance

The submersible pill box is horizontal and cylindrical and may be transported by freight car or towed by boat. The principal differences between this pill box (Model 2) and the Model 1 Pill Box are as follows:

- a. The bore of the gun is larger.
- b. The mobility of the gun is somewhat greater.

The pill box consists of a hull section, engine section, armament, necessary fittings and spare parts.

a. Hull and Fittings

The hull and fittings consist of steering gear, flooding and blowing apparatus, ventilating apparatus, and living quarters.

(1) The steel hull is horizontal and cylindrical and can withstand a hydraulic pressure of six atmospheres. In the bottom of the hull there are auxiliary tanks; on the outside of the hull, ballast tanks; in the upper section of the hull, elevators and gunseats; in the bow and stern, other equipment.

(2) The steering gear consists of a vertical rudder and necessary controlling gear and is operated by hand from the cockpit under the front elevator.

(3) The flooding and blowing gears consist of air reservoirs, flooding and blowing piping, vent valves, and other necessary valves. Flooding is done by gravity; in the buoyancy tanks blowing is done by compressed air (this air is in the reservoirs); in the auxiliary tanks blowing is done by hydraulic pumps. The air reservoirs are charged by a compressor.

(4) The ventilation system consists of a blower, ventilator pipes, air intake-exhaust pipes, and ventilation shut-off valves.

(5) In the living quarters there are folding beds, oxygen generators, air conditioners, water purifying tanks, food stores, toilets, etc. The power supply for the oxygen generator and air conditioner is sufficient for 48 continuous hours for four men; the food and water supply is sufficient for four men for one week.

b. Engines

The engine equipment consists of a main engine, auxiliary machinery, shafting, and piping.

(1) The main engine is a 15 HP semi-diesel engine (used for surface movement).

(2) The auxiliary machinery consists of an air compressor, pressure water pump, and blower.

(3) The shafting consists of a propeller shaft, bearing, stern tube, and propeller.

(4) The piping consists of cooling, fueling, and blowing systems. There are two fuel tanks (150 liters each) in the forward section of the hull.

c. Electric Equipment

The electric equipment consists of a main motor, storage battery, electric light equipment, and distributor.

(1) The main motor is a 10 HP DC, motor (for surface movement and auxiliary machinery).

(2) There are 36 storage batteries (6 volts, 30 amps) and the these supply the main motor, electric lights, and radio.

(3) The electric light equipment consists of two electric bulbs (40 w).

(4) The distributor equipment consists of a control board, switchboard, and necessary wiring.

d. Equipment

The equipment consists of a gun and radio.

(1) The gun is a Model IV, 7.5cm small craft gun which is mounted on the upper central part of the hull. The cartridge case in the hull has 30 shells.

(2) There is one vehicular radio and this is installed in the upper section of the storage battery room in the bow section of the hull.

3. Essential Data

Crew	three or four men
Length	9.5 meters
Width	2.7 meters
Height	4.5 meters
Diameter of hull	2.0 meters
Displacement	22.2 tons
Armament	one experimental 7.5cm small craft gun
Vehicular radio	one
Submersible depth	30 meters
Submersion limit	48 hours
Main engine	one 15 HP semi-diesel
Standard cruising speed - surfaced	3 knots
Standard cruising speed - submerged	2 knots
Maximum cruising range - surfaced	150 miles
Maximum cruising range - submerged	8 miles
Surfacing and diving speed - surfacing	20 seconds
Surfacing and diving speed - diving	40 seconds