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

1. Article 4 of subject report, dealing with laboratory procedures in Japanese ordnance research as outlined by Target O-39 of Fascicle O-1 of reference (a), is submitted herewith.
2. The investigation of the target and the target report were accomplished by Lt. Comdr. J.R. Lyman, USNR.



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O-39-4

JAPANESE ORDNANCE RESEARCH - ARTICLE 4
LABORATORY PROCEDURES

"INTELLIGENCE TARGETS JAPAN" (DNI) OF 4 SEPT. 1945
FASCICLE O-1, TARGET O-39

FEBRUARY 1946

U.S. NAVAL TECHNICAL MISSION TO JAPAN

SUMMARY

ORDNANCE TARGETS

JAPANESE ORDNANCE RESEARCH - ARTICLE 4 LABORATORY PROCEDURES

A brief description of the Japanese Naval Proving Ground is given, with references to experimental work in other localities.

In general, there appeared to be a tendency on the part of the Japanese Navy to accept laboratory results without confirmation by tests under service conditions.

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REFERENCES

Location of Target:

Kamegakubi Proving Ground, KUREHASHISHIMA, Hiroshima Prefecture

Related NavTechJap Target Reports:

Japanese Ordnance Research, Article 1 - Gunfiring of Bombs at the Kamegakubi Naval Proving Ground, Index No. 0-39-1.

Japanese Ordnance Research, Article 2 - Experimental Research on Super High Velocity Guns and Projectiles, Index No. 0-39-2.

Japanese Ordnance Research, Article 3 - Torpedo Models, Index No. 0-39-3.

Japanese Heavy Armor, Index No. 0-16.

Japanese Interior Ballistics, Index No. 0-21.

LIST OF ENCLOSURES

- (A) List of Japanese Documents Forwarded through ATIS to Washington Document Center.

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and Other Fuze Components Page 9

INTRODUCTION

This report is designed as a brief outline of Japanese laboratory and development procedures in ordnance discovered in the course of investigation of targets concerning guns and interior ballistics. References are made to other target reports and to Japanese documents that give full descriptions of developments in particular specialized fields.

A month was spent in KURE studying the Naval Arsenal and the nearby Kamegakubi Proving Ground, and six weeks in TOKYO, interviewing personnel and reviewing documents found in the Ordnance Library at the Yokosuka Navy Yard.

THE REPORT

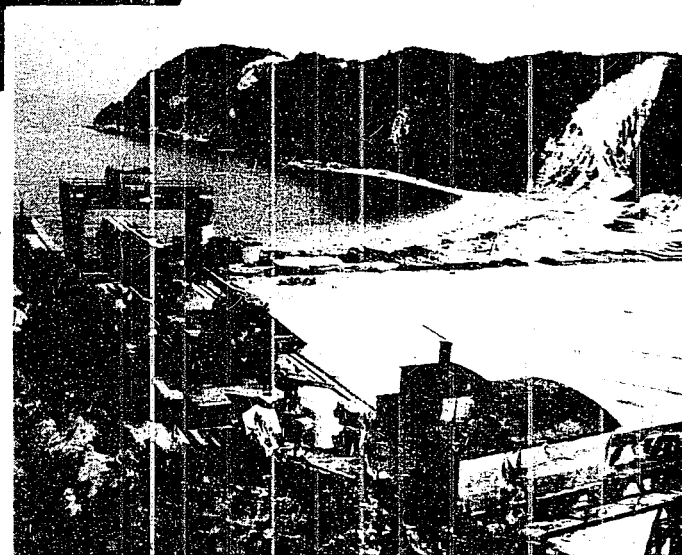
Part I - THE JAPANESE NAVAL PROVING GROUND, KAMEGAKUBI

Both routine acceptance test work and developmental work in ordnance were carried out at the Japanese Naval Proving Ground. It was located on the southern tip of the island of KUREHASHI, at a place called KAMEGAKUBI ("neck of the turtle"), which could be reached from Kure Naval Arsenal only by boat. As the name implies, the proving ground was located on an isthmus, which was only a few hundred yards wide, and provided access by water to both ends of the firing line. The spot was well chosen for a small proving ground, since the nature of the terrain provided hillsides for ground impacts, clear water ranges, and hill tops where guns could be mounted for firing downward for water impact studies, all in close proximity; but the same rugged terrain made it extremely difficult to expand the scope of the proving ground. Additional activities were located in two coves farther north on the east side of KUREHASHISHIMA, connected with the main proving ground by a rather poor road.



Figure 1
RIGHT (SOUTHWEST) SIDE OF
FIRING LINE AT KAMEGAKUBI
(Showing velocity towers
and armor butts)

Figure 2
LEFT (SOUTHEAST) SIDE OF
FIRING LINE AT KAMEGAKUBI
(Showing gun mounts, gan-
tries, armor storage, etc.
On hillside in background
is cable railway leading
to water-impact gun posi-
tion.)



At the main proving ground were located the administration buildings, barracks, magazines, powder and ammunition handling sheds, and a shrine. A single firing line, served by two gantry cranes, was used both for ranging and proof work, and for armor impacts. By a rather laborious jacking operation, one gantry could be turned 90° and run down the left side of the firing line, where armor plate was stored, to the butts, where, after another 90° turn, it served the plate butts. Figures 1 and 2 are views of this area. To the left of the butts was a steep hillside used for ground impacts of projectiles. To the right, through the velocity towers, was a clear line of fire southward across the Inland Sea toward SHIKOKU. A number of small islands are located in the Inland Sea at suitable spots for triangulation stations; range boats patrolled the area when firing was being conducted, and it is stated that no complaints were ever received of projectiles falling on land, such as occasionally occurs when firing down a river.

The area was not bombed, but it suffered badly in a typhoon in September 1945, which knocked down half the velocity towers, caved in hillsides and did other damage. At the time the Proving Ground was first visited, demolition work by demilitarization forces was well under way, but the larger structures were still untouched. Unfortunately, most of the velocity equipment and other delicate apparatus had already been disposed of.

In the first cove north of the main proving ground were located a light armor testing range, a reduced scale range for research on penetration ballistics, and a sawed-off 16" gun for research on obturators. In the second cove were a power house, more magazines, and a battery of broadside guns served by a small gantry. These guns were fired to the northward against armor plate or concrete blocks, for impact fuze tests, research on concrete penetration, and so forth.

On a hillside southeast of the main proving ground was a mount for guns used in research on under-water trajectory of projectiles. These guns were fired north-westward, various angles of impact with water being possible, while a beach backed by a steep bluff was a "backstop" for projectiles that ricocheted. The gun position was served from a dock directly below it by a cable-railway up the hillside.



Figure 3
"TIME-PRACTICE" PROJECTILES, 8cm TO 14cm

Two novel types of projectile were employed by the Japanese Navy for proving ground work. "Time practice" projectiles (Figure 3) were used with a time fuze to get points on the trajectory of AA guns. The smoke puff that resulted after fuze action was triangulated from ground stations. An alternative method was to use an illuminating projectile and record the flash on a camera at 100 frames per second. The other type of projectile (Figure 4) was used in tests of detonators and other components of impact fuzes. It was fired against armor or a sand butt, and after impact was disassembled for examination of the results. Both types of projectile are characteristic of the Japanese willingness to accept results of experimentation under non-service conditions as indicative of the behavior of service ordnance.



Figure 4

8cm TO 12cm PROJECTILES FOR IMPACT TESTING
OF DETONATORS AND OTHER FUZE COMPONENTS

NavTechJap Report, "Japanese Heavy Armor," Index No. O-16, gives a full description of the activities of the Proving Ground as far as development work on armor is concerned, while NavTechJap Report, "Japanese Ordnance Research, Article 1 - Gunfiring of Bombs at the Kamegakubi Naval Proving Ground", Index No. O-39-1, describes the procedure for testing aircraft bombs by firing from smoothbore guns.

A document found at YOKOSUKA (NavTechJap Document No. MD-21-3402) describes in great detail the development tests of the projectile for the 10 cm 65 caliber gun, including fragmentation tests of the projectile both for number and size distribution of fragments and penetration ability of fragments against armor plate. It is noteworthy that no fragment velocity measurements were made; indeed, it is stated that the Japanese Navy never developed a method of measuring such velocities.

Part II - OTHER EXPERIMENTAL ACTIVITIES

Some idea of Japanese experimental procedures in certain other fields of ordnance can be gathered from a translation of the captured documents listed in Enclosure (A). The work on gun flash was one of the activities on which most effort was spent, but most of the research was conducted using a special mortar or combustion bomb, rather than a gun firing service ammunition, and hence the results are of dubious value. This again is an illustration of Japanese willingness to design ordnance directly from laboratory experiments.

ENCLOSURE (A)

LIST OF DOCUMENTS FORWARDED THROUGH ATIS TO WASHINGTON DOCUMENT CENTER

<u>NavTechJap Document No.</u>	<u>Title (contents) and Date</u>	<u>ATIS Number</u>
ND-50-3461	Results of measurement of vibration of 20 cm. 50 cal. guns of KINUGASA. 1935.	4288
ND-50-3476	Determining temperature and gas composition at muzzle for various guns. 1936.	4362
ND-50-3436	High speed cameras for use in photographing penetrative ballistics. 1940.	3691
ND-50-3438	Investigation of Krupp 8.8 cm. 40 cal. AA gun. 1940.	4230
ND-21-3402	The 10 cm. 65 cal. DP gun. (development of projectile). 1940.	4232
ND-50-3415	Effect of powder moisture on muzzle velocity and bore pressure. 1941.	4266
ND-21-3420	Muzzle flash. (methods of measuring and recording) 1943.	4224