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U. S. NAVAL TECHNICAL MISSION TO JAPAN
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From: Chief, Naval Technical Mission to Japan.
To : Chief of Naval Operations.

Subject: Target Report - Japanese Naval Rockets.

Reference: (a) "Intelligence Targets Japan" (DNI) of 4 Sept. 1945.

1. Subject report, covering Target O-09 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. R.A. Cooley, USNR.

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JAPANESE NAVAL ROCKETS

"INTELLIGENCE TARGETS JAPAN" (DNI) OF 4 SEPT. 1945

FASCICLE O-1, TARGET O-09

DECEMBER 1945

U.S. NAVAL TECHNICAL MISSION TO JAPAN

SUMMARY

ORDNANCE TARGETS

JAPANESE NAVAL ROCKETS

Japanese naval rockets are formidable, satisfactorily performing weapons which were developed and put into production too rapidly for much refinement. Rockets were more and more valued by the Japanese as experience increased and perhaps reached their most spectacular use in the rocket-propelled Baka suicide plane.

The Japanese methods of manufacture and quality control were rather elementary compared to American methods.

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REFERENCES

Japanese Personnel Interrogated:

Capt. M. NAGAISHI, IJN, Naval Air Department Catapult and Assist-Take-Off Section.

Comdr. HAYAKAWA, IJN, in charge of rocket development, branch of the First Naval Technical Arsenal at KANAZAWA.

Comdr. Y. KOZU, IJN, in charge of rocket development, Experiment Department, KURE Navy Yard.

Lieut. K. NISHIDA, IJN, engineering assistant to Comdr. KOZU.

Mr. IWAI, rocket engineer, Second Naval Powder Arsenal at HIRATSUKA.

INTRODUCTION

The purpose of this report is to summarize findings on the state of development, salient features and operational effectiveness of Japanese naval rockets and to note any ideas of value in manufacture or quality control methods.

THE REPORT

I. Historical Background

The Japanese claim to have begun theoretical studies of solid fuel rockets as early as 1931, but over ten years elapsed before production for operational use was realized. Early in 1944 or late in 1943 (the exact time was not clear), naval officers observed the test firing of army 20 cm. rockets and the decision to manufacture such rockets for naval land troops was made. The navy began production of 20 cm. rockets (but not an exact duplicate of the army 20 cm. rocket) about March 1944.

In May 1944 trial production of 45 cm. rockets patterned after the army 40 cm. spin stabilized rocket commenced but they were never manufactured in large numbers. Commander HANAMIZU, who was in charge of rocket development at KURE Navy Yard, personally supervised the construction of the first lots of this type rocket. He then accompanied the first shipment which was rushed to the PHILLIPINES on the battleship ISE. In the PHILLIPINES he was to train the naval troops in the use of this weapon which represents the largest solid propellant rocket used operationally by any nation in World War II.

By July 1944, the 12 cm. incendiary shrapnel anti-aircraft rocket and its 28-multiple launcher were developed and were installed on several aircraft carriers and battleships.

Next, armor-piercing anti-tank rockets with shaped charges in 20 cm., 10 cm., and 8 cm. sizes were gotten into production in April 1945.

II. Salient Features of Japanese Rockets

The design of rockets by the Japanese appears to have been accomplished by the "cut and try" process rather than by new theories on optimum design rules.

The salient features of Japanese naval rockets are shown in Table I.

III. Evaluation of Operational Use of Rockets

The aircraft carriers ZUIKAKU and others, as well as the battleships ISE and HYUGA, were fitted with 28-multiple launchers for the 12 cm. incendiary shrapnel anti-aircraft rocket. This rocket and its launcher were used in action off the PHILIPPINES. No records were available on hits made, but it was said that these rockets were highly valued for their increasing of fire power of the ship and for their threatening effect.

The 20 cm., 10 cm., and 8 cm. shaped charge rockets were said to have never been used in enemy action.

As mentioned earlier, the 45 cm. rocket was rushed to the PHILLIPINES with Commander HANAMIZU to assist in the introduction of the new weapon and to help in training troops in its use. It is believed the 45 cm. rocket was used operationally in the PHILLIPINES, but Commander HANAMIZU was killed in action at MANILA and no information was available on how effective the Japanese considered this rocket under battle condition.

IV. The Development, Manufacture and Testing of Naval Rockets

The solid propellant for Japanese naval rockets was developed and manufactured at the Second Naval Powder Factory, HIRATSUKA. The design and manufacture of metal parts including launchers was carried out at the KURE Navy Yard. Test firing of rockets was carried out on the island of KAMEGA KUBI near KURE.

There appears to be nothing worthy of note in Japanese rocket manufacturing methods, which appear less efficient and precise than American methods.

For control testing, one rocket in each lot of 500 was field fired.

V. Anticipated Developments

The use of liquid hydrogen peroxide as a fuel for rockets was receiving a good deal of consideration by the Japanese and, through technical information received from GERMANY, commerical quantities of 80% hydrogen peroxide were being manufactured. However, all developments were still in the experimental stage.

A weapon for use against B29's was uppermost in the minds of weapon designers. A rocket with the following characteristics is typical of Japanese paper plans:

Maximum height of flight	15,000 meters
Outside diameter	12 centimeters
Length	300 centimeters
Weight of charge	23 kilograms
Total weight of shell	75 kilograms
Burning time	1.15 seconds
Kind of propellant	solid FDT powder

It was said that no experimental model of this rocket was ever constructed.

Table I
SALIENT FEATURES OF JAPANESE NAVAL ROCKETS

NAME	PURPOSE	WEIGHT TOTAL (kg)	WEIGHT OF CHARGE (kg)	KIND OF CHARGE	NUMBER OF GRAINS	OUTER DIAMETER OF GRAIN (mm)	INNER DIAMETER OF GRAIN (mm)	LENGTH OF GRAIN (mm)	IGNITOR BLACK POWDER (gm)	PRIMER	FUSE	NUMBER OF NOZZLES	MINIMUM NOZZLE DIAMTER (mm)	DIAMTER OF MOTOR (cm)	DIAMETER OF HEAD (cm)	LAUNCHER	RANGE (m)	LATERAL DISPERSION	LONGITUDINAL DISPERSION	STABILIZATION	WHEN DEVELOPED	REMARKS
45 cm Heavy Rocket (Ju Funshin dan)	Barrage (by Naval Brigade)	660	167.2	Type 91 (TNA)	37	58	10	36x390 1x400	150	Type 3 Percussion Case or Pulling	Type 5 Percussion Model 12	6 6	38.5	45	45	Wooden with 2 wheels.	1600	About 10% of range.	About 10% of range.	Spin 3000 rpm. (0-20°)	April 1944	Dispersion not accurately measured. Used in Philippines.
20 cm H.E.R.	Barrage	90		Type 91 (TNA)	7	58	10		50	Type 3 Percussion Case or Pulling	Type 5 Percussion Model 12	6		20	20	Model 3 wooden	1800	Below 10% of range.	About 10% of range.	Spin 3600 rpm. (0-25°)	March 1944	This rocket was altered to Model 1. with greater range.
20 cm H.E.R. Mod. 1.	Barrage	84.65	15.7 (?)	Type 91 (TNA)	7	58	10		50	Type 3 Percussion Case or Pulling	Type 5 Percussion Model 12	6	16.5	20	20	Model 3 wooden	4500	About 10% of range.	About 10% of range.	Spin 3600 rpm. (0-25°)	Jan. 1945	Most commonly used 20 cm type.
20 cm I.S.R.	Barrage and AA	88.9		Incendiary Gun and Shrapnel	7	58	10		50	Type 3 Percussion Case or Pulling	Type 5 Combination Model 1	6	16.5	20	20	Model 3 wooden	3700			Spin 3600 rpm. (0-25°)	Nov. 1944	
20 cm S.C.R.	Anti-Tank			Type 98					50	Type 3 Percussion Case or Pulling	Type 5 Percussion Model 2	6		20	20	Experimental	1500			Spin 3600 rpm. (0-25°)	April 1945	Only experimental.
18 cm S.C.R.	Anti-Tank			Type 98						Type 3 Percussion Case or Pulling	Type 5 Percussion Model 2	6		10	10	Experimental	1000			Spin 3600 rpm. (0-25°)	April 1945	Only experimental.
15 cm H.E.R.	Depth Charge			Type 91						Type 3 Percussion Case or Pulling	Anti-Submarine Model 2	6		15	15	Experimental	3000	About 10% of range.	About 10% of range.	Spin 3600 rpm. (0-25°)	April 1945	Not used.
12 cm H.E.R.	Barrage		1.63	Type 91	7	35	5	360	30	Type 3 Percussion Case or Pulling	Type 5 Percussion Model 2	6	11.5	12	12	Sextuple mounted on 2 wheels.	4800	About 10% of range.	About 10% of range.	Spin 3600 rpm. (0-25°)	Jan. 1945	Used on the "Shinzo"
12 cm I.S.R.	Barrage and AA	23.9		Incendiary Gun and Shrapnel	7	35	5	360	30	Pulling	Type 5 Combination Model 2	6	11.5	12	12	Sextuple mounted on 2 wheels.	4800	About 10% of range.	About 10% of range.	Spin 3600 rpm. (0-25°)	July 1944	Extensively used.
10 cm H.E.R.	Barrage	22.5		Type 98	7	30	5 & 10		15	Type 3 Percussion Case or Pulling	Type 5 Percussion Model 2	6	6.5	10	10		1200			Spin (0-30°)		Only experimental.
10 cm S.C.R.	Anti-Tank		1.59	Type 94	7	30	5 & 10		15	Type 3 Percussion Case or Pulling	Type 5 Percussion Model 2	6	6.5	10	10	Iron pipe	1200			Spin (0-30°)	March 1945	Pierced armor 10 cm thick.
8 cm H.E.R.	Barrage	9.8		Type 98	7	16	9 & 5		8	Pulling	Type 5 Percussion Model 2	6	5.5	8	8		1200			Spin (0-30°)		Only experimental.
8 cm S.C.R.	Anti-Tank		0.53	Type 94	7	16	9 & 5		8	Pulling	Type 5 Percussion Model 2	6	5.5	8	8	Iron pipe	1200			Spin (0-30°)	Sept. 1944	Pierced armor 7 cm thick.
2.5 cm H.E.R.	Barrage	5.58								Detonating Cap	Percussion Model 4	6		2.5	2.5	Iron pipe	1000				June 1944	Only experimental.

H.E.R. - High Explosive Rocket. S.C.R. - Shaped Charge Rocket. I.S.R. - Incendiary Shrapnel Rocket.