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JAPANESE AMMUNITION

C.I. AMN. TECHNICAL REPORT

No. 51

AMMUNITION
FOR
THE 70-MM. BARRAGE MORTAR
(SMOOTH BORE)

COMPILED BY

JAPANESE AMMUNITION

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REPORT NO. 51 NOVEMBER 1945

AMMUNITION FOR THE 70-mm. BARRAGE MORTAR (SMOOTH BORE)

G E N E R A L

This shell is fired from the 70-mm. Barrage Mortar and is presumably intended for use against low-flying aircraft. The mortar is a crude weapon consisting of a smooth bore tube, a wooden base and a spike which is driven into the ground at an angle to give the elevation required. It is presumably the intention to use a large number of these mortars to put up a heavy concentration of small parachute supported explosive cylinders which will be ejected from the shell near the top of its trajectory and which will detonate if an aircraft strikes any part of the cylinder or parachute. The body and the canisters which it contains are also attached to parachute.

2. Two of these shell were received here in March 1945 and a further three in April 1945; the former were in good condition but the latter had been badly affected by damp.

3. At Plate A are shown the details of the shell while the general appearance of the components is shown in the photograph at Plate B. The shell, for the purposes of description, may be divided into the following parts:-

(i) The body which contains in the base its own propellant charge a delay and the main ejection charge and which houses seven canisters with their parachutes.

(ii) The Propellant Charge held in a container at the base of the shell body.

(iii) The Canisters, each of which contains an explosive cylinder and its parachute, and

(iv) The Explosive Cylinders which have a plastic filling and are initiated by a friction igniter.

D E S C R I P T I O N
(See Plate A)

THE SHELL BODY (13)

4. This is made of steel and is closed at the bottom by a heavy steel base (31) which is welded on to the body. A block of wood (30) is secured into the bottom of the body by one wood screw; knotted into this block is the body parachute cord (5) to the other end of which is attached the body parachute (7). The delay holder (32) is screwed into the metal base and passes

The wooden block is recessed at the top and at the bottom of this recess lies a steel disc (29) with a small hole in the centre. Resting on the top of the block is a steel disc (27) to the under side of which is welded a strip of steel bent into the form of a triangle which contains the main ejection charge (28). The disc (27) has 7 small holes and on top of it lie one felt (26) and 2 cardboard washers (25) each of which is perforated with 7 holes to accommodate the igniters (24) of the 7 canisters (15).

The bulk of the shell is filled with these canisters, six of which are arranged around the periphery with their parachute, cords and shroud lines (14). The remaining canister occupies the centre space but its parachute etc. are carefully folded and laid over the top of the 7 canisters.

The body (13) and closing plug parachutes (4) with their cords and shroud lines (5, 2 & 6) are carefully folded and housed in the remaining space at the top of the shell. They are separated from each other by light cardboard or brown paper discs and the body parachute is in addition wrapped in brown paper. All these parachutes are made of silk. The top of the shell is closed by a cup (3) and plug (1) into which is knotted the parachute cord and which are secured to the body by six radial nails.

THE PROPELLANT CHARGE.

5. The propellant charge consists of rhombic greenish yellow pellets of nitrocellulose and is contained in a sausage-shaped silk bag (34) which is bent end to end and stuck to the bottom of the propellant container (33).

This container is a steel cup which is drilled with six flash holes to allow the propellant gases to escape. The holes are sealed with tissue paper. The propellant container (33) is attached to the body by coning into an annular groove in the base.

A brass primer (35) filled G.P. fits over the end of the delay holder and also rests on the bottom of the container, access to the cap being gained by a small central hole in the propellant container, which is normally covered by a tinfoil disc. In the primer body are four flash holes over which is stuck a strip of white paper. A transit cover fits over the base of the shell, and is held in place by a strip of adhesive tape.

THE CANISTERS (15) :-

6. Each of these is a welded steel tube closed at the bottom and open at the top. Close to the bottom is soldered a wire eye to which is attached the canister parachute cord and hence the parachute, so that when floating to earth the canister will hang upside down. A wooden block (23) fits into the bottom of this tube; this is similar in shape to, although much smaller than, the block (30) in the shell body. A recess at the top of the block (23) contains the explosive cylinder ejection charge (21) which is fired by an igniter (24) which projects through a hole in the bottom of the canister into one of the seven holes in the cardboard discs (25). A millboard disc (22) placed on top of the ejection charge acts as an obturator. The explosive cylinder (20) with its parachute, cord and shroud lines occupy the rest of the space in the canister which is closed by a disc of

and brought back into the canister through the same slot. In this way the explosive cylinder parachute is packed immediately above the explosive cylinder and its cord is thus formed into a large loop which is packed outside the canister. In the case of the central canister this loop (11) is accommodated at the top of the shell; in the other 6 cases it is fitted into the main part of the shell.

THE EXPLOSIVE CYLINDER (20)

7. This is a fairly thick-walled seamless steel tube closed at one end and filled with four pellets of R.D.X./wax. The bottom three are contained in a paper sleeve closed at both ends and are separated one from the other by a paper disc. The fourth pellet is also paper wrapped and is recessed at the top to take a booster consisting of a lead azide pellet (19) and a perforated powder pellet (18). A cardboard washer lies on top of these pellets, above which is a perforated pellet of R.D.X./wax, which is paper wrapped and whose central cavity is lined with a paper sleeve. The red phosphorus head of the friction cone hangs down into this central cavity.

The friction igniter unit (17) which is also of steel, screws into the top of the explosive cylinder, the space between the igniter and the top pellet being taken up by a thick felt washer. The friction composition is held in a brass cup which screws into a recess in the bottom of the igniter unit. The friction cord passes right through the igniter unit and is knotted to the explosive cylinder parachute cord. The knot lies on top of the igniter unit and is covered with a piece of silk cloth, which is drawn into the annular groove of the igniter unit and secured with a length of silk thread; it is also tied to the parachute end by a similar piece of thread. In this case the parachute is made of paper.

ACTION

8. The transit cover is removed and the shell is dropped down the barrel; a fixed striker at the bottom of the barrel fires the shell in the usual manner. The flash from the primer ignites both the delay composition and the propellant at the same time. The delay burns for about 8 seconds which roughly corresponds to the time of flight to the top of the trajectory. When the delay is burnt through the flash travels through the small hole in the disc (29) and ignites the main ejection charge. This pushes forward the felt and cardboard discs (26 & 25) which act as a obturator, and forces out the canisters, parachutes and closing plug shearing the 6 nails in so doing. At the same time the small delay at the bottom of each canister is ignited and these in turn ignite each explosive cylinder ejection charge. This forces the explosive cylinder with its parachute out of the canister.

The shell body and canisters, now empty of their contents and the closing plug fall harmlessly to earth attached to their parachutes. The explosive cylinders also fall earthwards, the jerk caused by the opening of the parachute not being sufficient to operate the friction igniter. If an aircraft strikes any part of the cylinder or parachute, the friction igniter will be functioned and the cylinder will detonate. Should no hit be obtained on the cylinder, it, too will fall to earth; in this state it is in a dangerous condition as a pull of 10 - 20 lbs. will function the igniter.

IDENTIFICATION

9. The shell body and explosive cylinders are oil blackened internally and externally and are also painted black on the outside. The propellant container and transit cover appear to be oil-blackened both inside and out. The canisters are painted a light-blue grey inside and out and bear no other markings.

Both the shell body and the explosive cylinders have a red band round the top, indicating that they are filled. The nature of the round is painted in white in Japanese Characters on the shell body; painted in white on the body of the explosive cylinder is a warning in Kana syllables which may be translated as: "Dangerous; do not disturb".

FRAGMENTATION

10. A fragmentation trial was carried out on one of the explosive cylinders and the results are shown together with a photograph of the fragments at Plate C.

CHEMICAL ANALYSIS

(The Chief Inspector of Military Explosives, Kirkee)

COMPONENT	NATURE OF FILLING	PERCENTAGE COMPOSITION	QUANTITY
1.Primer filling.	Gunpowder.	Quantity insufficient for quantitative analysis.	13 grs.
2.Propellant.	Nitrocellulose. Diphenylamine.	98.5% 1.5%	372 grs.
3.Delay composition.	Mealed gunpowder:- Sulphur. Pot.Nitrate. Charcoal.	 40.3% 45.0% 14.7%	20 grs.
4.Main Ejection Charge.	Gunpowder G.20:- Sulphur. Pot.Nitrate. Charcoal.	 9.3% 74.6% 16.1%	56 grs.
5.Igniter composition.	Mealed gunpowder.	Quantity insufficient for quantitative analysis.	2.3 grs.
6.Explosive cylinder. Ejection charge.	Gunpowder.	-do-	7.3 grs.
7.Friction composition.	Pot.Chlorate. Sulphur. Antimony sulphide. Binding material.	-do-	3.1 grs.
8.Head of Friction Cord.	Red Phosphorus.	-do-	-

9.H.E.Filling:-			
1st Pellet (perforated)	R.D.X.	98.0%	25.0 grs.
	Wax.	2.0%	
2nd Pellet.	R.D.X.	98.0%	33.0 grs.
	Wax.	2.0%	
3rd Pellet.	R.D.X.	97.9%	29.0 grs.
	Wax.	2.1%	
4th Pellet.	R.D.X.	98.2%	34.0 grs.
	Wax.	1.8%	
5th Pellet.	R.D.X.	98.0%	33.0 grs.
	Wax.	2.0%	
			154.0 grs.
10.Booster.	(i) Gunpowder	-	1.5 grs.
	(ii) Lead azide	-	2.5 grs.

APPRECIATION

11. The standard of workmanship of the shell and its components is good but it is doubtful if the complete round is very waterproof. Certainly, some of the rounds examined here, had been badly affected by damp.

Fragmentation trials carried out on two explosive cylinders both gave good results and it is considered that one of these cylinders would produce much about the same effect as a 20-mm. H.E. round. However, in order to produce a hit a very large number of these cylinders must be in the air at a time and hence a large number of dischargers is required and as these are so simple, a large concentration of them is possible.

A great disadvantage lies in the fact that these explosive cylinders have no self-destroying element and therefore very many of them will fall to the ground in a dangerous condition and will endanger neighbouring troops.

SUMMARY OF DATA

12. Complete Round.

Length (with transit cover)	... ...	11.4-ins.
Diameter (over rear band)	... ...	2.75-ins.
Weight.	... ...	5-lbs. 4-ozs.

13. Propellant Charge.

Weight.	... ...	372-grs.

14. Primer.

Length.	... ...	0.86-ins.
Diameter (rim)	... ...	0.43-ins.
Diameter (mouth)	... ...	0.37-ins.

15. Body.

Length.	9.75-ins.
Diameter (over parallel portion)	2.5-ins.
Length of parachute cord.	6-ft. 3-ins.
Length of shroud lines.	1-ft. 2-ins.
Diameter of parachute.	1-ft. 4-ins. (12 sided, each side 4-ins.)

16. Canister.

Length.	6.5-ins.
Diameter.	0.777-ins.
Weight (filled - less parachute etc.) ...	3.25-ozs.
Length of parachute cord.	11-ins.
Length of shroud lines.	10-ins.
Size of parachute.	5.8-ins.X 5.5-ins.

17. Explosive Cylinder.

Length (overall).	3.38-ins.
Length (without igniter).	3.0-ins.
Diameter.	0.6-in.
Weight (filled - less parachute etc.) ...	2.75-ozs.
Weight of filling.	154-grs.
Length of parachute cord.	3-ft.6-ins.
Length of shroud lines.	2-ft.2-ins.
Diameter of parachute.	1-ft.11-ins. (Octagonal, each side 9").

18. Closing Plug.

Length of parachute cord.	1-ft.9-ins.
Length of shroud.	11-ins.
Size of parachute.	8-ins.X 8-ins.

CHIEF INSPECTORATE OF AMMUNITION, INDIA, KIRKEE.

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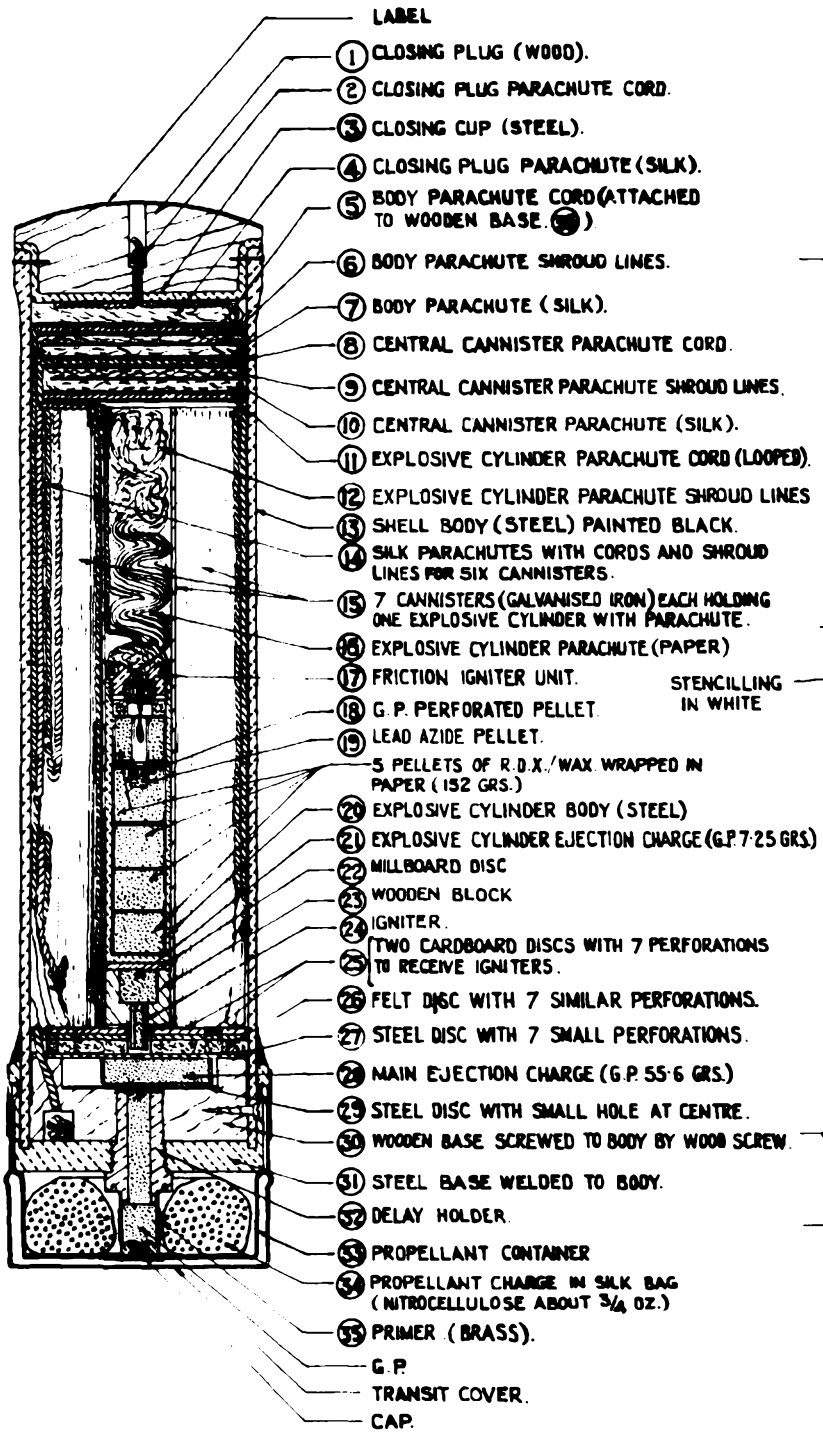

—JAPANESE, H.E.A.A., BARRAGE SHELL.—

— FOR —

— 70 MM. BARRAGE MORTAR. —

DIMENSIONS IN INCHES.

C.I.Amn.S/1223
KIRKEE.AUG.1945

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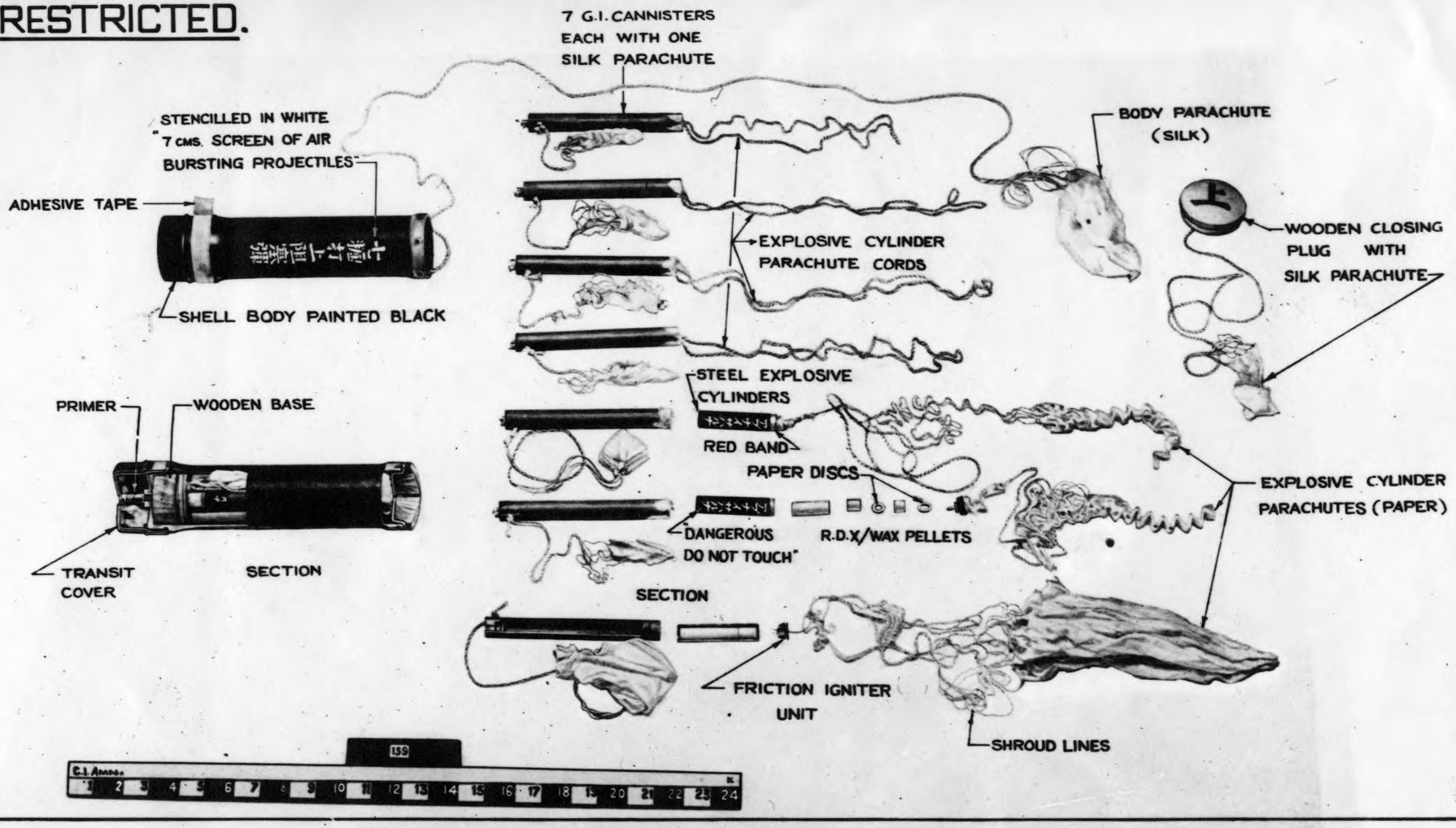

JAPANESE H.E. A.A. BARRAGE SHELL.

— FOR —

70 MM. BARRAGE MORTAR.

ASSEMBLY SEQUENCE & COMPONENT DETAILS.

C.I.AMN-S/1255
KIRKEE OCT. 45

PLATE B.

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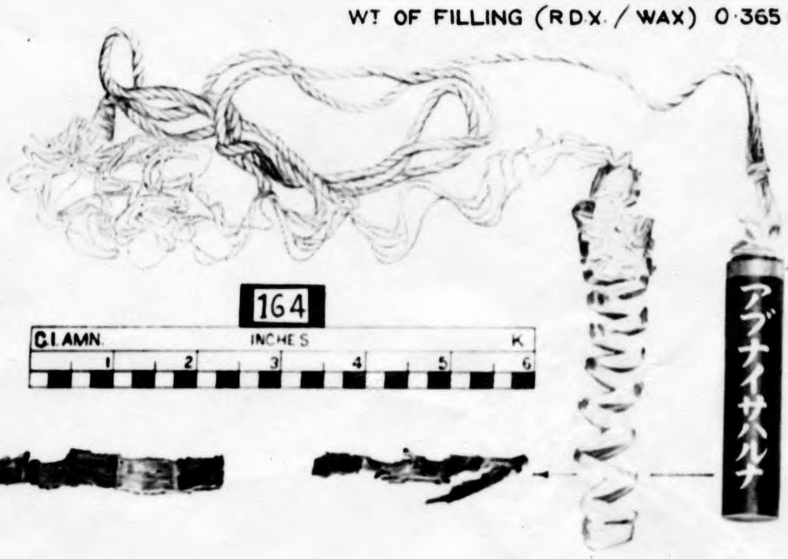
	ozs
WT OF FILLED CYLINDER (WITHOUT CORD & PARACHUTE)	2·751
WT OF STEEL EXPLOSIVE BODY ONLY	2·386
WT OF RECOVERED FRAGMENTS	2·272
PERCENTAGE RECOVERY	95·2 %

WT OF FILLING (RDX / WAX) 0·365 ozs.



WEIGHT CATEGORY (OZS.)	NUMBER OF FRAGMENTS	TOTAL WEIGHT (OZS)
1/4 TO 1/8	2	0·327
1/8 TO 1/25	10	0·582
1/25 TO 1/50	13	0·458
1/50 TO 1/100	41	0·575
LESS THAN 1/100	145	0·330
		2·272

STATIC FRAGMENTATION OF AN EXPLOSIVE CYLINDER FROM JAPANESE H.E. A.A. BARRAGE SHELL 70 MM.

C.I.AMN.S/1226
PIRBLE NOV 45