

INTELLIGENCE REPORT
ON
JAPANESE CHEMICAL WARFARE

Volume V
Part F

JAPANESE CHEMICAL WARFARE
EQUIPMENT AND MATERIEL

15 May 1946

OFFICE OF THE CHIEF CHEMICAL OFFICER
GENERAL HEADQUARTERS, ARMY FORCES, PACIFIC

TOKYO, JAPAN

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2.) PROJECTILES, MORTAR

Mortar shells examined fall in three general classes, standard projectiles, anti aircraft and signal, and experimental projectiles.

Two types of tail design are shown, used with the ring type propellant above the fin, and oblate shaped propellant between fins.

Anti aircraft mortar projectiles are designed for use against low flying aircraft. They consist of a long slender tube with a propellant case which is lost in flight.

Experimental projectiles are fuzeless, designed to break on impact. These have solid fins and tail section which bring up a question as to means of propelling.

Approximately half of these mortar projectiles are without band markings. Of those marked with bands, only those on the colored smoke containing projectiles seemed to have a standard significance; smoke color is indicated in these cases.

655-PROJECTILE, 81MM, MORTAR, MARK 1, SPECIAL

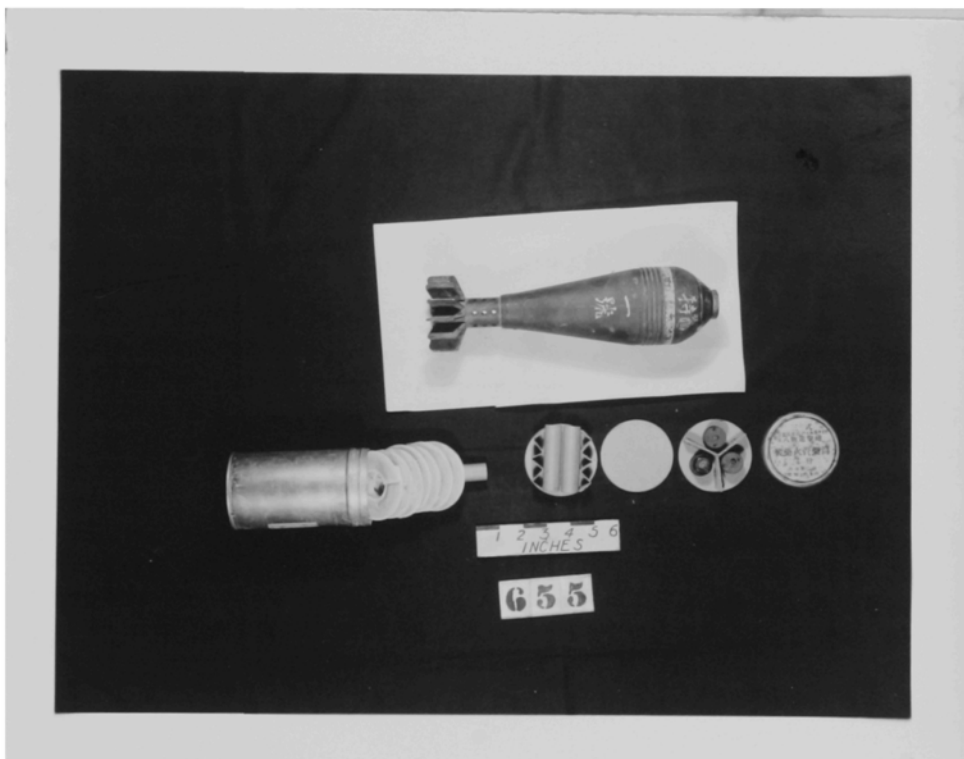
General:

Color: Unpainted
Markings: One yellow band painted above the bourrelet. Brush markings in white paint were found above and below the bourrelet. Those marks which were discernible were translated as follows: "Special 3/20, Mark 1, E-121".
Components: Body, Tail assembly, plastic nose cap.
Dimensions: 80mm Diameter, 11-3/4" long (less fuse)
Weight: 7 lbs. (less fuse)

Description: This projectile is similar to the standard type 3 tear shaped fin stabilized 80mm mortar shell having twelve equidistant fins. The body has a short ogive, and a forward bourrelet with five separate bearing surfaces separated by four grooves. The tail assembly is essentially a perforated cylinder inserted into the tapered end of the shell. The assembly has 18 flash perforations and the open end threaded to receive the percussion cap which is a part of the propelling charge.

Propelling Charge: The propelling charge container is a hermetically sealed thin walled metal can with a soldered metal tape. It is lined with cardboard and has the following components. In the bottom sector are fifteen yellow silk powder bags which are shaped like split washers. In the well formed in the center of these powder rings is a vertical cardboard cylinder containing one of three igniting cartridges. Above this section, in a compartment formed by two separated cardboard discs, are the remaining two igniting cartridges packed in a horizontal position. The igniting cartridges are essentially powder filled cardboard tubes sealed on both ends with blue silk. In the final and top compartment of the container are three firmly nested percussion plugs. These caps are threaded for attachment to the shell.

Remarks: The nose bushing of the projectile is sealed to the shell. The shell contents are not known. Yellow band indicate possible gas filling.



655-PROJECTILE, 81MM, MORTAR, MARK 1, SPECIAL

659A-PROJECTILE, 81mm, TYPE 89, SMOKE, MOD. 1, YELLOW

General:

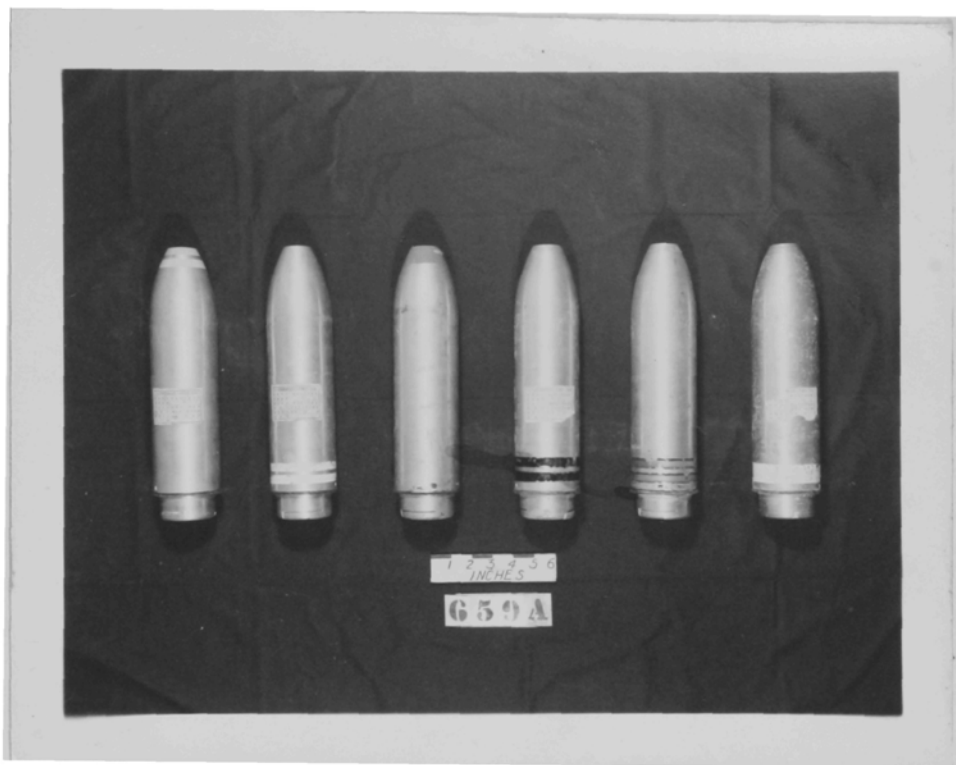
Color: Unpainted aluminum
Markings: Two yellow bands on the nose and one white label.
Components: Shell body, Shell base, Inside charge.
Dimensions: 12.6" long, 78mm Diameter.
Weight: 2.62 lbs.

Description: The body is made of aluminum. The nose hole is plugged with a thin lead disc, held in place by a brass ring which screws in the nose.

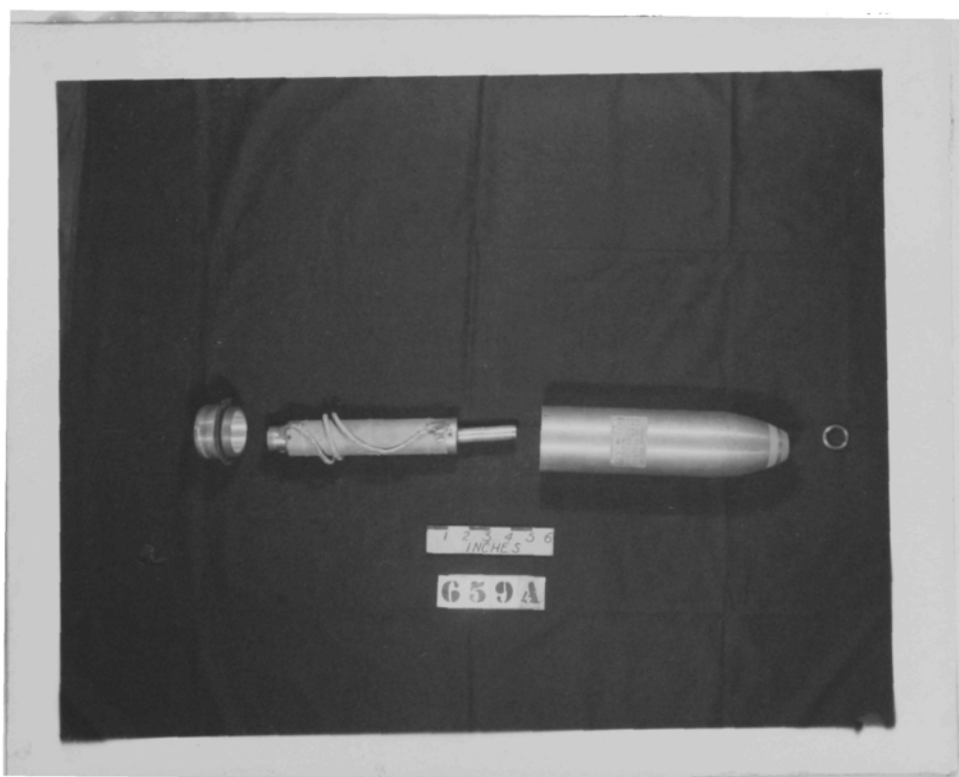
The base of the shell is made of aluminum, 6.5mm long and 2.9mm in diameter. There is a percussion cap inserted in a hole in the center of the base. There are two opposite slots in the wall of the base which, apparently, receives a propellant charge assembly. The base is attached to the shell body by a threaded coupling. A leather washer is fitted between the base and the shell body.

The inside charge is contained in a cardboard tube. A time fuse is wound spirally around the tube, connecting the percussion cap in the base to the powder charge in the front end of the tube. A small sheet metal cylinder connects the cardboard tube with the nose of the shell.

Remarks: The propelling assembly was not available for examination. It is believed that the nose plug is erupted in flight and that the colored smoke can be seen before the shell lands. The shell is used for signalling and is probably launched from the 81 mm Mortar.



659A 659B PROJECTILE, 81MM, SMOKE 659C 659D 659E 659F



EXPLODED VIEW
659A-PROJECTILE, 81MM, TYPE 89, SMOKE, MOD., 1, YELLOW

659F-PROJECTILE, 81mm, TYPE 89, SMOKE, MOD. 2, WHITE

General:

Color: Unpainted Aluminum.
Markings: One white band near the base and one white label.
Dimensions: Length 12.5", 78mm Diameter.
Weight: 2.65 lbs.

Remarks: This projectile is identical with Projectile, 81mm, Type 91, Smoke, Modif. 1, Yellow, except for the color of the smoke and the marking of the shell. Chemical filling is undetermined.

Upper photograph for 659A shows this item on extreme right. Exploded view is the same for this projectile as that shown for 659A.

659B-PROJECTILE, 81mm, TYPE 91, SMOKE, INFR. #2, WHITE

General:

Color: Unpainted Aluminum.
Markings: Two white bands near the base with one white label.
Dimensions: Length 12 1/2", 78mm Diameter.
Weight: 2.59 lbs.

Remarks: This projectile is identical with projectile, 81mm, Type 89, Smoke, Modif. 1, Yellow, except in the color of the smoke and the shell markings. Chemical filling is undetermined.

Upper photograph for 659A shows this item second from left. Exploded view is the same for this projectile as that shown for 659A.

659C-PROJECTILE, 81mm, TYPE 91, SMOKE, IMPR #2, RED

General:

Color: Unpainted Aluminum
Markings: One red band around the nose and one white label.
Dimensions: Length 12.5", 78mm Diameter.
Weight: 2.59 lbs.

Remarks: This projectile is identical with Projectile, 81mm, Type 89, Smoke, Modif. 1, Yellow, except for the color of the smoke and the marking of the shell. Chemical filling is undetermined.

Upper photograph for 659A shows this item third from left. Exploded view is the same for this projectile as that shown for 659A.

659D-PROJECTILE, 81mm, TYPE 91, SMOKE, IMPR. #2, BLACK

General:

Color: Unpainted Aluminum
Markings: Two black bands near the base with one white label.
Dimensions: Length 12.5", 78mm Diameter.
Weight: 2.59 lbs.

Remarks: This projectile is identical with Projectile, 81mm, Type 89, Smoke, Modif. 1, Yellow, except for the color of the smoke and the markings of the shell. Chemical filling is undetermined.

Upper photograph for 659A shows this item fourth from left. Exploded view is the same for this projectile as that shown for 659A.

659E-PROJECTILE, 81mm, TYPE 91, SMOKE, MOD. 2, GREEN

General:

Color: Unpainted Aluminum.
Markings: Two green bands near the base and one white label.
Dimensions: Length 12.5", 78mm Diameter.
Weight: 2.65 lbs.

Remarks: This projectile is identical with Projectile, 81mm, Type 91, Smoke, Modif. 1, Yellow, except for the color of the smoke and the markings of the shell. Chemical filling is undetermined.

Upper photograph for 659A shows this item fifth from left. Exploded view is the same for this projectile as that shown for 659A.

~~SECRET~~

655A-SHELL, MORTAR, 81 mm, TYPE 100, FOR TYPE 97 Mortar

General:

Color: Unpainted nose and body with black tail.
Markings: Japanese characters giving nomenclature.
Components: Nose, Body, Tail.
Dimensions: Overall length $13\frac{1}{2}$ in. Diameter 80mm
Weight: 8.35 lbs. (less filling and fuse)

Description: Nose: The nose is hemispherically shaped with a $11/16$ in. threaded hole which receives the fuse. The fuse being absent, a steel plug fills the hole. The posterior part of the nose is threaded and screws into the body of the shell. The nose is made of $1\frac{1}{2}$ " steel.

Body: A steel sleeve $2\frac{1}{2}$ " in diameter and $1-5/16$ " wide is fitted inside the body. A steel disc $1/8$ " thick separates the sleeve from the nose. There are two flash holes in the disc. There is a disc $\frac{1}{4}$ " thick that fits the other side of the sleeve. The sleeve and the two discs fit together to form a circular box. The posterior part of the body is threaded and screws into the tail.

Tail: There are four gas rings located where the tail joins the body. There are 6 fins attached to the tail. The flash cartridge is inserted into the hollow end of the tail. There are 18 flash holes around the cylinder. The propelling charge is attached to the six fins.

Remarks: This shell did not contain any filling. It is not known what kind of filling was to be used in this shell. The tail is believed to be identical with the tail, of the 81 MM, 100 model H E Mortar Projectile as described in TM E9-1901, pp 93-94. The body and nose probably is a revised model to be used with a chemical filling.



655A-SHELL, MORTAR, 81 mm, TYPE 100, FOR TYPE 97 MORTAR

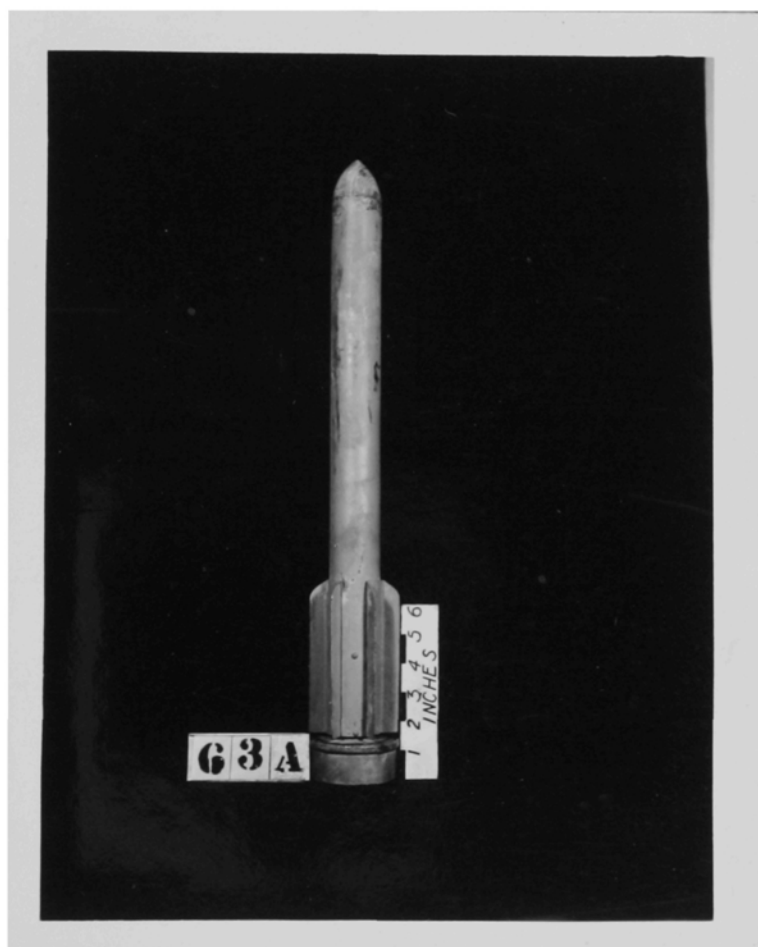
63A-PROJECTILE, 81MM, MORTAR, AA, FLARE

General:

Color: Light gray body, fins and propelling assembly, red nose.
Markings: None
Components: Ogival shaped nose, tubular body, six equally spaced tail fins, propelling assembly, red rubber cover fitting over fins and propelling assembly.
Dimensions: Diameter of tube 1-3/4", Diameter of propelling assembly 80mm, Overall length 21-3/4".
Weight: 5 lbs.

Description: The tubular body is formed of longitudinally welded pipe. In one end is inserted the ogival wooden nose plug which is secured in place by two nails. The nose is sealed with a paper strip. On the opposite end three sets of double fins are welded to the body. These fins are 5 1/4" long and equally spaced around the barrel. Between each fin set and at about 2 1/2" from the barrel end is a round headed screw. The propelling assembly is joined loosely to the body with three set screws. The propellant charge assembly has six equally spaced cardboard covered ports in the base surrounding a foil covered percussion cap.

Remarks: The filling of this shell is not known but is believed to be a flare round. It is similar to the flare round, 81mm AA Mortar projectile designed for use against low flying aircraft (of "Handbook of Japanese Explosive Ordnance" OPNAV 30-3M pp 161-162). Items 63B and 63C are of the same type projectile.
This shell possibly contains a self-destroying element which is activated by the ejection charge. The propellant charge assembly is lost in flight relieving the projectile of the high air resistance afforded by the cylindrical propellant container. The set screws which hold the propellant charge container to the base of the projectile are sheared by the explosive force of the propellant charge, and the high air resistance of this container pulls it out of the rear of projectile while in flight.



63A-PROJECTILE, 81MM, MORTAR, AA, FLARE

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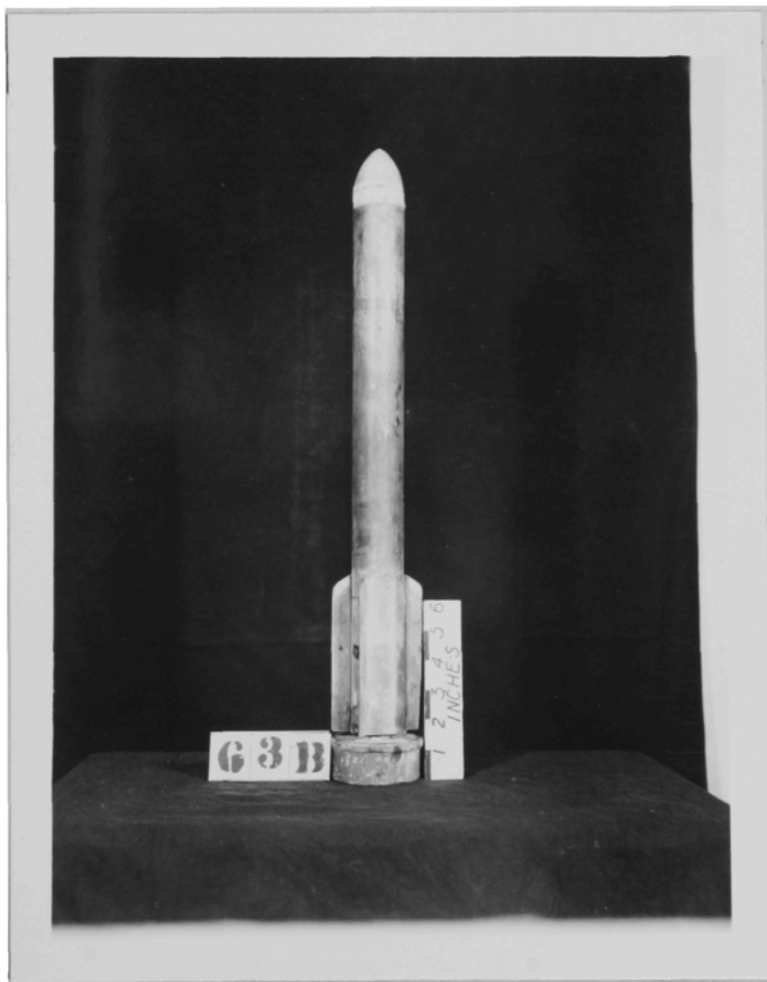
63B-PROJECTILE, 81MM, MORTAR, AA, HE SMOKE

General:

Color: Unpainted body and propelling assembly having the color of galvanized iron, yellow nose.
Markings: One green band.
Components: Ogival shaped nose, tubular body, six equally spaced tail fins, propelling assembly.
Dimensions: Diameter 1-3/4", Diameter of propelling assembly 80mm, Overall length 21-3/4".
Weight: 5 1/2 lbs.

Description: This projectile has in general the same external features as 63a and 63c (q.v.). It is further described in "Handbook of Japanese Explosive Ordnance" ONAV 30-3M pp 161-162 as follows-"The forward portion of the body contains a steel tube filled with HE and attached to two parachutes. There is a smoke pellet on the bottom of the suspended cylinder. The after portion contains a delay train and expelling charge. The expelling charge ignites the smoke flare pellet which burns about 53 seconds and which then ignites the short delay train which burns 7 seconds before the self destroying element functions. The line to the upper parachute is attached to a pull igniter and if pulled before the self-destroying feature operates, will detonate the charge."

Remarks: This shell should not be tampered with.



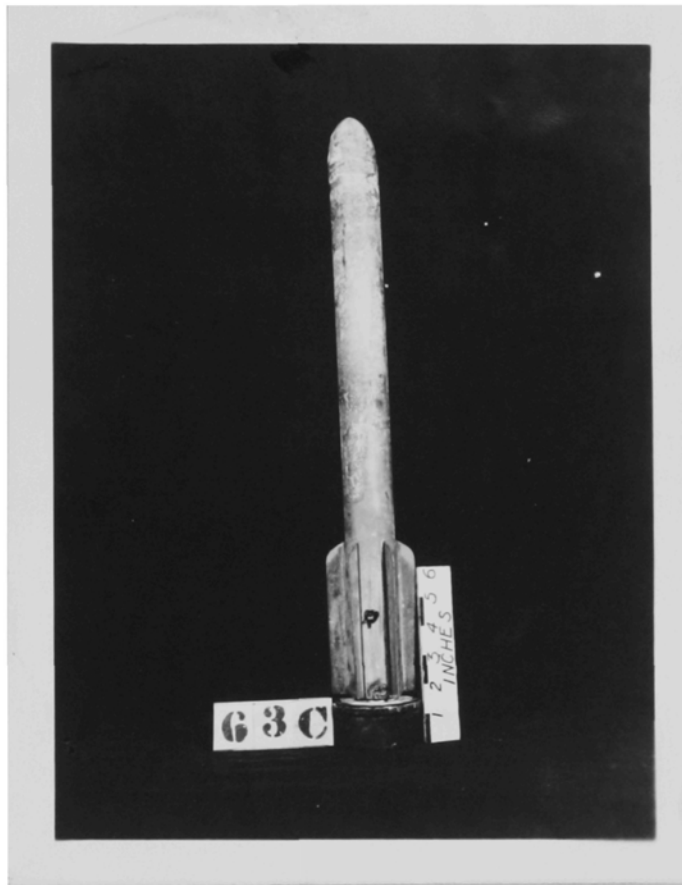
General:

Color: Gray body and fins, green nose, black propelling assembly.
Markings: One red band.
Components: Ogival shaped nose, tubular body, six equally spaced tail fins, propelling assembly.
Dimensions: Diameter of tube 1-3/4", Diameter of propelling assembly 80mm, Overall length 22".
Weight: 4-3/4 lbs.

Description: The tubular body is formed of longitudinally welded pipe. In one end is inserted the ogival wooden nose plug which is fastened securely in place by two nails. The nose is sealed with a paper strip. On the other end of the tube three sets of double fins are spot welded to the body. These fins are 5 1/4" long and equally spaced around the barrel. Between each fin set and at about 2 1/2" from the barrel end is a round headed screw sealed with brown lacquer. The propelling assembly is joined loosely to the body with three set screws. The propelling assembly has six equally spaced cardboard covered ports in the base surrounding a foil covered percussion cap.

Remarks: The filling of this shell is not known. It is similar to other 81mm shells designed for use against low flying aircraft (of "Handbook of Japanese Explosive Ordnance" OENAV 30-3M pp 160-162, also Items 63a and 63b).

This shell possibly contains a self-destroying element and should not be tampered with. The marking system, red band, indicates a sneezing gas filling, (Mk II Special Chemicals), however no analysis was made of the filling.



63C-PROJECTILE, 81MM, MORTAR, 66, PRIME 100, RED BAND

564A-PROJECTILE, 81mm, MORTAR, EXPERIMENTAL, FUZELESS

General:

Color: Unpainted metal
Markings: none
Components: Nose, Body, Tail
Dimensions: Overall length 13.4", Diameter 80mm.
Weight: 7.42 lbs. (less filling and fuze)

Description: Nose: The nose is hemispherically shaped, threaded on the end that screws into the body. There is no fuze hole in the end of the nose.

Body: The body is made of two parts which screw together. Inside the front half of the body there is a steel ring $1\frac{1}{2}$ " wide and $\frac{1}{4}$ " thick. There are four machined grooves in this steel ring spaced equidistantly.

Tail: The tail is conical shaped. Six fins are welded perpendicular to the posterior portion of the tail.

Remarks: As there are no holes in the flash cartridge cylinder, it is believed that this projectile examined, was not completed. The weld bead is very rough. The entire shell is made of finished steel except the tail fins. The projectile was found with no filling. Photograph for this item shows items 564A, 564B, 564C, 564D, and 564E respectively in that order.



564B-PROJECTILE, 81mm MORTAR, EXPERIMENTAL, FUZELESS

General:

Color: Black
Markings: There are two white marks, but their meaning is unknown.
Components: Nose, Body, Tail, Fin assembly
Dimensions: $13\frac{1}{2}$ " long, 80mm Diameter.
Weight: 7 lbs. (less filling)

Description: Nose: The nose is hemispherically shaped and is threaded on the end that screws into the body. The nose does not have a fuze hole.

Body: On the outside of the body, near the nose, there is a groove $1\frac{1}{2}$ " long, $\frac{3}{32}$ " wide, $\frac{1}{8}$ " deep. The reason for the groove is unknown. The posterior part of the body is threaded and screws into the tail.

Tail: The tail is conical shaped and is threaded inside on both ends. The fin assembly screws into the tail.

Fin assembly: The fin assembly consists of six fins welded onto a steel cylinder.

Remarks: The method of propelling this projectile has not been determined.

Photograph for item 564A shows this projectile second from left.

564C-PROJECTILE, 81mm MORTAR, EXPERIMENTAL, FUZELESS

General:

Color: Unpainted metal
Markings: None
Components: Nose, Body, Tail, Fin assembly
Dimensions: $13\frac{1}{2}$ " long, 80mm Diameter.
Weight: 9.24 lbs. (less filling)

Description: Nose: The nose is hemispherically shaped and is made of very poor material. There are many flaws in the metal. The nose screws into the body.

Body: The body, or middle section of the shell, is three inches long. A steel cylinder inside the body is $1\frac{3}{8}$ " long and $2\frac{1}{4}$ " in diameter. This cylinder is closed on each end by a steel plate each of which has two small flash holes. The cylinder and the two plates fit together to form a circular box. The body screws into the tail.

Tail: The tail section is the largest of the sections, and is probably used with a chemical filling. The tail is 7.2" long, 80mm in diameter, tapering to 32mm at the end.

Fin assembly: The fin assembly consists of six fins welded onto a steel cylinder. A threaded lug on the front of the cylinder screws into the tail section.

Remarks: The method of propelling the shell has not been determined. The shell examined was not filled and the contents to be used in this shell are unknown.

Photograph for item 564A shows this projectile third from left.

564D-PROJECTILE, 81MM MORTAR, EXPERIMENTAL, FUZELESS

General:

Color: Unpainted metal
Markings: None
Components: Nose, Body, Tail, Fin assembly
Dimensions: 14.7" long, 80mm Diameter.
Weight: 9.25 lbs.

Description: Nose: The nose is hemispherically shaped and screws into the body.

Body: The body is 6" long and in the front end of the body there is a steel cylinder closed on each end by a steel disc, each of which has two flash holes. The remaining part of the body and the tail contains the main filling. The body screws into the tail.

Tail: The tail is conical shaped and is threaded on each end on the inside. The fin lug screws into the tail.

Fin assembly: The fin assembly consists of six fins welded to a steel cylinder.

Remarks: The shell examined was not filled.. The method of propelling the shell is unknown.

Photograph for item 564A, shows this projectile fourth from left.

564E-PROJECTILE, 81MM, MORTAR, EXPERIMENTAL, FUZELESS

General:

Color: Unpainted nose and body with black body and tail assembly.
Markings: Japanese, giving nomenclature.
Components: Nose, Body, Tail, Fin assembly
Dimensions: 17" long, 80mm Diameter.
Weight: 9.91 lbs.

Description: Nose: The nose is hemispherically shaped and does not contain a fuze hole. The threaded end of the nose screw into the body.

Body: The body is 5.9" long. There is a steel cylinder in the front end of the body, closed by two steel discs, each of which has two flash holes. The cylinder and the two discs fit together to form a circular box. The remaining part of the body and the tail contain the main filling. The body screws into the tail.

Tail: The tail is conical shaped and has 4 gas rings located where the body screws into the tail.

Fin assembly: The tail extends to form a cylinder to which are welded six fins. There are 18 flash holes in the cylinder. The flash cartridge is inserted into the cylinder. The propelling charge is attached to the fins.

Remarks: The shell examined was not filled and the filling that is used in this shell is unknown.

Photograph for item 564A shows this projectile on extreme right.

General:

Color: White
Markings: Red band around nose, Japanese characters giving kind of shell and date of manufacture.
Components: Nose, Body, Tail and Fin assembly.
Dimensions: Length 22.7", 89mm Diameter
Weight: 18 lbs.

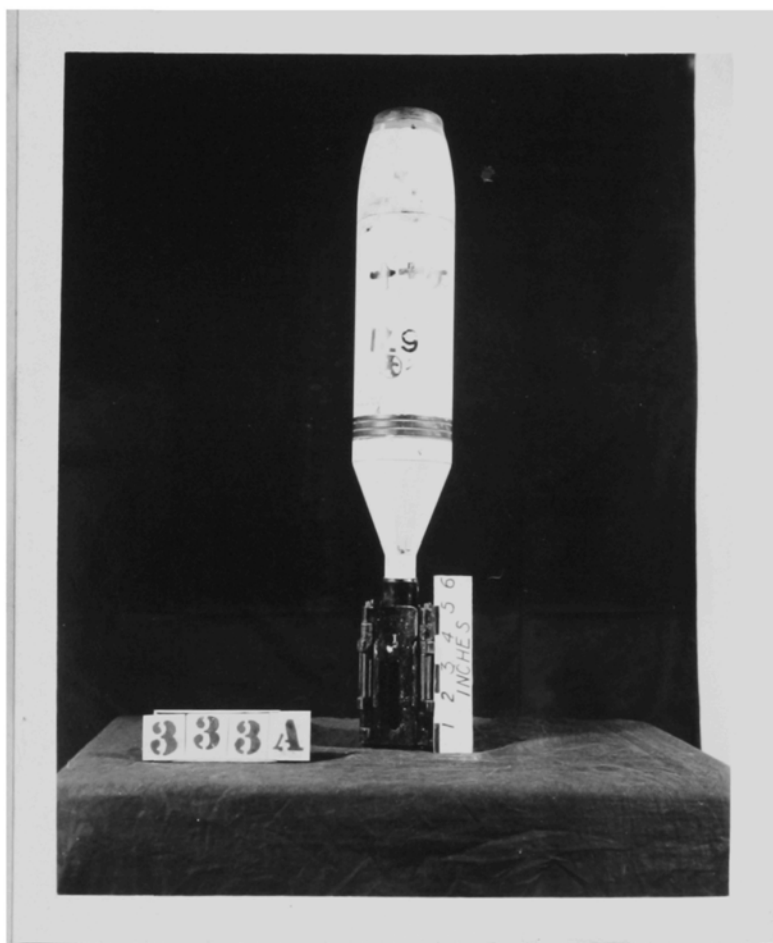
Description:

Nose: The nose is ogival shaped. The plug in the end of the nose is removable and can be replaced with a fuze.

Body: The body is 3.6 in. long and has three gas rings near the tail.

Tail and Fin assembly: The tail is conical shaped and tapers down to a cylinder 1.1 in. in diameter to which a flash cartridge cylinder is attached. Eight fin plates are attached to the cylinder and when the projectile is launched the plates form four fins. Shear wires hold the plates flat against the cylinder until the shell is launched. When the shear wires are broken, small coil springs force the fins into position. The shear wire is released when the flash cartridge explodes. The projectile is shipped with flash cartridge inserted and should be handled with caution. The propelling charge is attached to the fin plates, but is not placed on the projectile until time of use.

Remarks: The shell examined was not equipped with a fuze. There was tag attached that was written in English, stating that this projectile contained white phosphorous. It is assumed that the collecting team gathered this information from the source from which the shell was obtained. The projectile examined was manufactured in September 1942.



3334-PROJECTILE, 90mm, MORTAR, TYPE 1, SMOKE, PROV., FOR TYPE 94 LIGHT MORTAR.

~~RESTRICTED~~

333B-PROJECTILE, 90mm, LIGHTAR, TYPE 94, SMOKE, SUBSTITUTE FOR
TYPE 94 LIGHT LIGHTAR

General:

Color: Blue nose and black body and tail.
Markings: A yellow band around the body, and a Japanese symbol identifying it as a smoke shell, Red band around the nose.
Components: Nose, Body, Tail.
Dimensions: Length 15.8", 89mm Diameter.
Weight: 11.6 lbs.

Description:

Nose: The nose is ogival shaped. The plug in the end of the nose can be replaced by a threaded fuze.

Body: The body is conical shaped and tapers toward the fins. There are four gas rings near the nose.

Tail: The tail consists of a flash cartridge cylinder to which is attached six fins. The flash cartridge cylinder is attached to the body. There are 18 flash holes in the cylinder. The propelling charge is attached to the fins before launching.

Remarks: A typewritten note in English was attached to this projectile stating that the shell was filled with FC. It is assumed that the collecting team gathered this information from the source from which the projectile was obtained.



316B-PROJECTILE, 90MM, MORTAR, G43, (EMPTY)

General:

Color: Grey body with black tail assembly.
Markings: One white band and one tan band below the bourrelet. At one time there had been a band above the bourrelet. This mark which is now masked with a coat of grey paint was found to be a tan band superimposed over an earlier yellow band. It is probable that the marking of this shell has been revised.
Components: Body, Booster, Tail assembly.
Dimensions: Diameter 90mm, 15-3/4" long, less fuse.
Weight: 9½ lbs. empty.

Description: This mortar projectile consists of a tear shaped steel body with six equidistant fins on the tapered end and four grooves on the bourrelet. The fins are welded in pairs to the tail assembly which is essentially a short perforated cylinder, which contains the ignition cartridge, attached, by a threaded lug to the tapered end. There are twenty flash perforations in rows of four. The fins are flanged to hold the powder increments. The steel body, including ogive, is machined in one piece.

Remarks: This shell is similar in every respect but color and marking to the 9cm Model 94 HE Mortar Shell depicted in TM E9-1901 p 100. According to the extant markings the bomb filling is not indicated. Originally, the shell may have been designated as HE-Steel with the tan band on the body indicating point of balance.



316B-PROJECTILE, 90MM, MORTAR, GAS, (EMPTY)

563-PROJECTILE, 90MM, MORTAR, GAS

General:

Color: Black
Markings: Two white bands in front of the fins.
Components: Nose, Body, Tail.
Dimensions: 25" long (less fuze), 89 mm diameter.
Weight: 11 $\frac{3}{4}$ lbs. (empty).

Description: Nose: The nose is ogival shaped and is welded to the body. There is a fuze adapter which screws into burster tube adapter which in turn screws into the body. The burster tube is 8 $\frac{1}{2}$ " long, and 1.4" in diameter.

Body: The body is cylindrically shaped and the rear 3 $\frac{1}{2}$ " tapers down to a cylinder of 1 $\frac{1}{2}$ ". There are four gas rings just forward of the tapered part.

Tail: The tail is a cylinder which has 24 flash holes in it. To this cylinder are attached four double fins which are held against the cylinder until it is fired. The fins are equipped with hinges and springs. The fins are held against the cylinder by a small wire that is released when the projectile is fired. The flash cartridge fits inside the tail cylinder. The propelling charge is attached to slots in the fins.

Remarks: This projectile would hold approximately one liter of vesicent gas.



562-PROJECTILE, 150mm. MORTAR, VELOCITE G.S.

General:

Color: Blue-gray bands, 1 white band.
Markings: 2 yellow bands, 1 white band.
Components: Nose, Body, Tail.
Dimensions: Length 28 in. ; Diameter 148 mm.
Weight: 41½ lbs. (empty)

Description:

Nose: The nose is ogival shaped and has a fuze adapter which accepts a nose fuze.

Body: The body is conically shaped, tapering toward the tail. There are four gas rings located near the nose.

Tail: The tail is a cylinder containing 6 rows of 5 each flash holes. Six fins are welded to the cylinder and the propelling charge fits into the fin slots. The flash cartridge fits into the tail cylinder. The flash from the cartridge passes through the ports and ignites the propelling charge.

Remarks: The exact filling of this projectile is undetermined; however it is probably (indicated by markings) H, L or HL.



613-PROJECTILE, 32 cm., SPIGOT MORTAR

General:

Color-	Black all over
Components-	Nose section, middle section, tail section
Dimensions-	60 inches long, (less fuze) 32 cm. diameter
Weight-	662½ lbs. (empty)

Description: Consists of three sections threaded together. The nose section is a short ogival piece with fuze well in one end and male threading on the other. Inserted in the base of the nose section is a circular steel plate which is cupped in the center to fit over a second fuze pocket in the middle section. The middle section is threaded to fit the nose and has a male lug for coupling with the tail. The tail section has a slight retreating taper for two thirds of its length upon which four equidistant and perpendicular tail fins have been welded. The fins are supported by two sets of wire struts. The tail section has a tapped well near its coupling. The purpose of this well was not determined.

Remarks: A similar projectile has been described in "Japanese Projectiles and Fuzes" M.D.I.U. No. 4-U.S.N. p. 65. Therein this item is referred to as "320 mm Spigot Mortar Projectile."



61A-PROJECTILE, 50MM, GRENADE, TYPE 89, HE

General:

Color: Black
Markings: One yellow band
Dimensions: 4-3/8" long less fuze and shipping plug,
Diameter 50mm.
Weight: Empty

Description: Except for markings and filling this shell is similar in outward appearance to the 50mm Type 95 smoke shell as reported in "Japanese Chemical Warfare" looseleaf notebook p W. 21.

Remarks: This shell is fired from the 50mm Type 89 Grenade Discharger.



3.) PROJECTILES-ROCKETS

Rockets reported here are not those used by the army and navy during the later part of the war, but a group of experimental and unreported rocket projectiles. They vary from 9 cm to 25cm in diameter and show considerable variation in construction and material.

Changes in design were brought about by three aims, stability in flight, extended range, and an effective warhead. The first is noted in variations in fins and spin stabilization; the second changes in size of projectile and dropping the propellant tube, and the third by experimentation with various metal and ceramic war heads.

Most of these items contain neither propellant nor filling and are consequently difficult to evaluate completely.

There was no recognizable system of marking applied to these projectiles.

RESTRICTED

689-PROJECTILE, ROCKET, 72mm

General:

Color: Black
Markings: Red band around nose; $\pm$ weight variation mark, Arabic numeral 205 and Tokyo Arsenal mark all in white on body of the projectile.
Contents: Propelling charge and powder sacks in rear end of the projectile.
Dimensions: 12 $\frac{3}{4}$ inches long (minus fuze), 70 mm diameter
Weight: empty- 7.9 lbs w/propelling charge - 8.6 lbs.

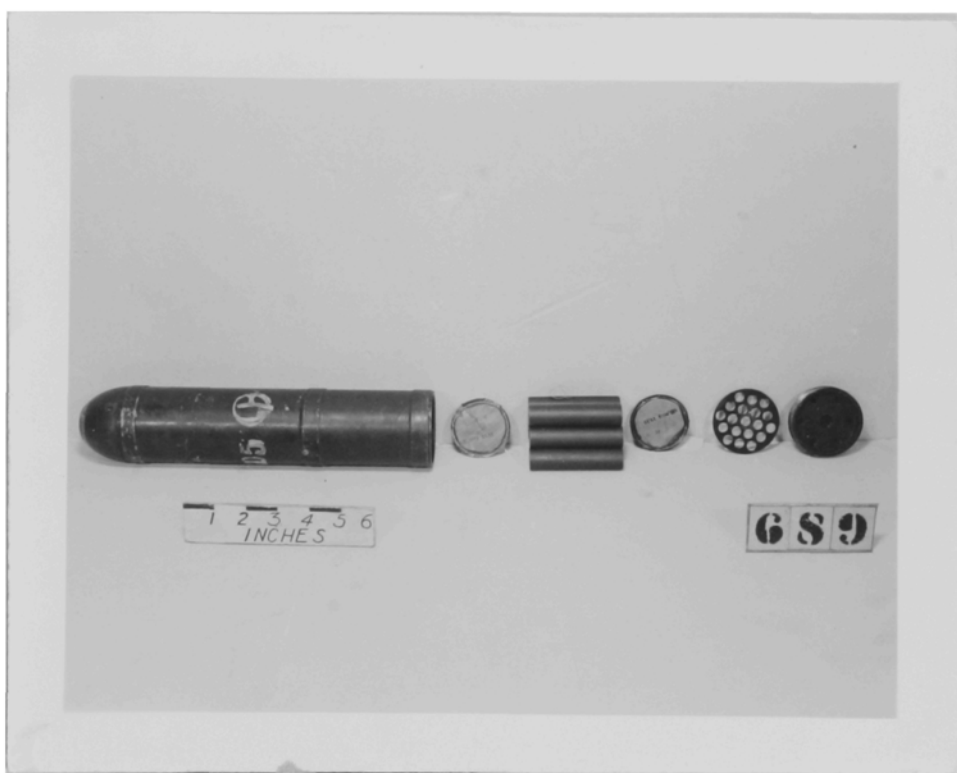
Description: This projectile has a short ogive. It is made of heavy steel, machined along its length. About the body are bands, approx. $\frac{1}{8}$ inch wide, one at the base, one about $\frac{2}{5}$ of the way up the body and the third below the top of the body where the nose is screwed to the body.

The nose of the projectile has in its base two recesses for a spanner wrench to be used for removal or placement of the nose. A $\frac{15}{16}$ inch female threaded opening having 13 T.p.l. receives the fuze.

The interior of the forward part of the projectile holds the explosive charge. It is the warhead of this projectile. This space is of parabolic shape (on the longitudinal cross section) toward the rear. A hole, about $\frac{3}{4}$ inches in diam. is at the base of this section. This hole contains through the middle of the projectile a distance of 1 to $1\frac{1}{2}$ inches to a stainless steel plate which closes off the top of the propelling tube section.

The rear of the projectile houses 2 black bags and seven $3\frac{3}{8}$ inches long, $\frac{13}{16}$ inch diameter burning type single perforated powder (probably ballastite) rods. The powder containing bags are of oiled silk. These propellant components are arranged in the following order from the base end forward one silk, powder bag, a $\frac{1}{8}$ in. thick metal separating disc containing $\frac{19}{32}$ inch diameter holes, the ballastite rods set side by side in the cross section and the second powder bag. A $2\frac{1}{2}$ inch diameter screw-in plug closes the base end of the projectile. In the center of this plug is a $\frac{15}{32}$ inch diameter threaded hole, apparently for receiving an ignition element for flaming the propellant charges. There are 6 - $\frac{1}{8}$ inch diameter equally spaced holes, in this base plug, gas escapes ports. These holes are drilled through at an angle with the obvious intent of imparting a rotating motion to the projectile in flight. Two lug recesses, diametrically opposite, are in this base plug, providing a means for removal of the plug.

Remarks: This projectile is probably H E filled (in the nose end).



689 - TEXTILE, ROCKET, 72mm

668A-PROJECTILE, 10 cm., ROCKET

General:

Color: Unpainted steel
Components: Warhead, warhead coupling, propellant tube,
jet tube coupling, jet tube, tail assembly.
Dimensions: Diameter of warhead - 10 cm
Overall length of rocket - $33\frac{1}{4}$ inches,
Weight: $23\frac{1}{2}$ lbs. (empty).

Description: The warhead is formed by a short ogival nose threaded to a male reducing coupling. This coupling attaches to a relatively long steel tube which is the propellant tube. The coupling has a plugged well through its core which may serve for filling the warhead and may conceivably be fitted with an internal fuze. The tail end of the propellant tube is threaded to a steel pipe. Together these comprise the jet assembly. The cross section of this assembly is venturi-form roughly resembling an egg cup or even more vaguely an hour glass. Over the jet tube and threaded to its base is a short length of concentric steel pipe having four equidistant fin inserts riveted into its slotted wall. The tails of these four fins extend beyond the jet tube and well into the rocket flash. A six legged steel spider formed by six bars welded to an unthreaded hexagonal nut fits into the propellant tube and holds the propellant charge in place. Slots in the jet tube coupling holds the spider in place.

Remarks: This rocket is believed to be an experimental model. It was probably to be fired from a 10 cm rocket launching tube. Photograph shows rocket projectiles 668A, 668B, 668C, 668D and 668E.



66SA-PROJECTILE, 10cm., ROCKET

668B-PROJECTILE, 10 cm., ROCKET

General:

Color: Unpainted steel..
Components: Warhead, warhead coupling, propellant tube,
jet tube coupling, jet tube, bourrelet ring
cup..
Dimensions: Warhead diameter - 10 cm.
Overall length - 30.5 inch.
Weight: 22½ lbs. (empty).

Description: This rocket is similar to item 668 A (q.v.), almost identical in every respect. However there is no tail assembly. Instead, there is a steel ring threaded to the base of the jet tube which undoubtedly acts as a bourrelet giving a tail bearing surface when the projectile is in motion on the rocket launch. This steel ring forms a shallow cup around the base of the jet tube.

Remarks: This rocket is believed to be an experimental model. It was probably to be fired from a 10 cm rocket launching tube.

This projectile is illustrated second from left on photograph accompanying 668A.

668C-PROJECTILE, 10 cm., ROCKET

General:

Color: Unpainted steel.
Components: Warhead, warhead coupling, propellant tube,
jet tube coupling, jet tube, tail assembly.
Dimensions: Warhead diameter - 10 cm.
Overall length - 33.5 inches.
Weight: 23 $\frac{1}{4}$ lbs. (empty).

Description: This rocket is similar to item 668 A (q.v.) and is almost identical in every respect. The fin assembly in this instance, however, is cast in a single unit and is threaded to the base of the jet pipe. The tail unit is roughly conical at the base. Six fins project from this cone like long indices which extend beyond the jet tube and into the rocket flash.

Remarks: This rocket is believed to be an experimental model. It was probably to be fired from a 10 cm rocket launching tube. This projectile is illustrated third from left on photograph accompanying 668A.

668D-PROJECTILE 10 cm., ROCKET

General:

Color: Unpainted Steel.

Components: Warhead, warhead coupling, Jet ring, propellant tube, base plate.

Dimensions: Warhead diameter 10 cm., Overall length 26 1/2"

Weight: 19 lbs. (empty).

Description: This rocket is entirely different in design and principle from the rockets 668A, 668B and 668C (q.v.). The nose is interchangeable in all four rockets but this rocket has no jet tube or tail assembly. The tail end of its shorter propellant tube is sealed off by a conical base section which screws to it. This base section terminates in what could be termed a bourrelet which was undoubtedly intended to stabilize the rocket while in its firing tube. The warhead is attached to a longer coupling section than the three previously mentioned rockets. The warhead coupling is centerbored and plugged. The jet ring acts as an adapter between the warhead coupling and the propellant tube. The jet ring is male threaded on its outside circumference for threading to the coupling and female threaded on its inside circumference for attachment directly to the propellant tube. This ring is perforated with 16 sloping ports through which the propelling gases are ejected thus giving the rocket a torque as well as forward motion. The base section of this rocket is threaded to the propellant tube with left hand threading.

Remarks: This rocket is believed to be an experimental model. It was probably to be fired from a 10 cm rocket launching tube. This projectile is illustrated fourth from left on photograph accompanying 668A.

668E-PROJECTILE, 10 cm., ROCKET

General:

Color: Unpainted steel.
Components: Warhead, warhead coupling, jet ring, propellant tube, base plate.
Dimensions: Warhead diameter 10cm, Overall length 22 $\frac{1}{2}$ ".
Weight: 16 lbs. (empty).

Description: This rocket is identical with item 668D (q.v.) with two exceptions. It has a shorter propellant tube of the same design and the base section is threaded with right hand thread (668D is threaded with left hand thread) and set with a set screw.

Remarks: This rocket, also, is believed to be an experiment model. It was probably to be fired from a 10 cm rocket launch tube. This projectile is illustrated on extreme right on photograph accompanying 668A.

583G-PROJECTILE, 15 cm., ROCKET WARHEAD FOR

General:

Color: Aluminum
Components: Only the warhead was available for examination.
Dimensions: Diameter 15 cm., Length of warhead 23 inches.
Weight: 36 lbs. (empty).

Description: With the exception of the propellant tube coupling which is of steel this warhead is fashioned entirely of aluminum or aluminum alloy. The body is threaded at the nose to receive a solid conical nose plug. This plug extends the slender body taper to a natural apex. The nose plug closes a one inch well bore which extends longitudinally through the warhead and connects with a short threaded bore of four inches diameter. A steel baffle is threaded to the larger well and forms an adjustable separator between the two wells. The small bore well was found to be filled with sand and the larger threaded well showed evidence of having been sand filled at one time. It is believed that the center of gravity of this projectile can be experimentally controlled by varying the sand charge in the two wells and adjusting the position of the separating baffle. The male lug of a third section screw into the body and seal off the large threaded well. This third section couples the warhead to the propellant tube and contains a device believed to be a stabilizer for the rocket in flight. This "stabilizing" section has three large equidistant ports. A one inch tube threads to the forward end. Around this tube and held in place with a large hexagonal lock nut is a short triangular prism which appears free to revolve on its longitudinal axis. The faces of the prism are threaded to receive three small piston shaped inserts. These inserts have slightly recessed heads drilled with a small hole in the center and have slotted walls forming six teeth.

Remarks: This projectile is believed to be an experimental model.



583G-PROJECTILE, 15cm., ROCKET PROPHELED FOR

583F-PROJECTILE, 16 cm, ROCKET, WARHEAD FOR

General:

Color: Black
Components: Only the warhead was available for examination.
Dimensions: Diameter 16 cm., Length of warhead 17 inches (Less fuze).
Weight: 12½ lbs.

Description: This warhead has a longitudinally welded, short, cylindrical body attached to a blunt, longitudinally welded, conical nose. The after end of the warhead is formed of a short, longitudinally welded cone which is welded at its truncated apex to a short length of 2½ inch nipple and welded at its base to the cylinder body. The short nipple serves as a coupling for the propellant tube. Two small V shaped flanges are welded to the warhead body near its base. The flanges are believed to be launching guides. The warhead is point-detonating, and there is a fuze receptacle in the nose.



584E-PROJECTILE, 16.5 cm., ROCKET

General:

Color-	Black
Components-	Warhead, propellant tube, jet tube assembly; tail assembly missing from this item.
Dimensions-	Length (less tail and fuze) 36 inches Diameter of warhead 16.5 cm
Weight-	27½ lbs (empty)

Description: This rocket had the same jet tube and fittings for tail assembly as for items 584 B and 584 C and has essentially the same, but a fore-shortened propellant tube and a shorter warhead coupling. This item differs from items 584 B and 584 C greatly in the design of its warhead. It has a point detonating warhead with a conical nose that is fitted with a fuze coupling and a gaincoat. The warhead tapers slightly after end to a welded connection with a short length of coupling tube. The after end is plugged with a screw cap removable for filling. A conical cover of relatively thin sheet metal fits loosely over the rear of the warhead and is inseparably linked to it by three small steel cables attached to eyebolts. The warhead is inserted loosely in the propellant tube coupling and is fastened securely in place by four small set screws that terminate in shear pins. When the propellant tube is coupled in place it holds the conical cover firmly in its place over the after end of the warhead. Two V shaped flange guides are welded on opposite sides of the warhead.

Remarks: The operation of this rocket has been deduced in theory as follows: The burning charge in the propellant tube probably terminates in a small explosive charge which causes the four small shear pins to sever thus separating the warhead from the propellant tube and permitting the conical cover to fantail into the slipstream behind. This cover is secured to the warhead by the three steel cables and acts as a stabilizer for the warhead in the remainder of its flight. Lightened in weight in this manner, the rocket might possibly reach greater distances than it would otherwise.



584E-PROJECTILE, 16.5 cm., ROCKET

584B-PROJECTILE, 20 cm., ROCKET, WARHEAD FOR

General:

Color: Black overall
Components: Warhead, Propellant tube, jet tube, fin assembly.
Dimensions: Length 42 inches
Diameter of warhead 20 cm.
Weight: 24 $\frac{1}{2}$ lbs. (empty).

Description: The warhead is composed of four sections of thin sheet metal welded together, comprising a blunt conoidal nose a short ogive, a cylindrical body and a short conical after end. The after end has two v shaped flanges (for guides) welded to the after end and is attached to a short steel coupling which is center plugged for filling and insertion of a gaine. This coupling is threaded to a heavy steel tube which serves as propellant tube. The propellant tube is reduced with a jet coupling to which is attached the jet tube. Where the jet tube joins the coupling a venturi is formed by the two tapering bores. A longitudinal cross section of the jet coupling and jet tube would have much the appearance of an egg cup or a constricted hour glass. A conical tail assembly with four equidistant fins all of light sheet metal fits snugly to the outside taper of the jet assembly. It is locked to it with a circular locking nut screwed to the after end of the jet tube. The fins project a short way into the jet stream. The fins are stabilized with four single strap struts.

Remarks: This rocket may be intended for filling with vesicant agent. Photograph shows 584B and 584C.

584C-PROJECTILE, 20 cm., ROCKET

General:

Color: Black overall
Weight: 24 lbs. (empty).

Description: This item is identical to item 584B in every respect of appearance and dimension except that the warhead body is crimped with 16 lateral corrugations.

Remarks: Same as for item 584B. This projectile is shown on right marked C in photograph for 584B.



584B-PROJECTILE, 20 cm., ROCKET, WARHEAD FOR

583.-PROJECTILE, 29.5 cm., ROCKET, WARHEAD FOR

General:

Color-	Black
Markings-	M k 1 painted in white on the side of warhead
Components-	Only the warhead was available for examination
Dimensions-	29.5 cm. diameter
	29 $\frac{1}{2}$ inches long (less fuze)
Weight-	77 lbs. (empty)

Description: This point detonation warhead is comprised of an ogival machined steel nose welded to a cylindrical machined steel body. The body is tapped and plugged on its side. A reducing insert forms the base of the warhead and is female threaded for attachment to a 5-3/4 inch propellant tube or coupling.

Remarks: This item is similar to 583 H.



583E-PROJECTILE 23.5 Cal., ROCKET, WARHEAD PROJECTILE

There is no external difference between this item and 583D. In fact they are believed to be the same item. There is a slight variation in their length but this can readily be accounted for in the normal variations due to welding technique.



583H-PROJECTILE, 24 cm., ROCKET, WARHEAD FOR

General:

Color: Black
Markings: Mk 1 (Jap.) on the warhead in white paint.
Components: The warhead only, was available for examination.
Dimensions: Diameter of warhead 24 cm., Length of warhead 31 inches (less fuze).
Weight: 78 lbs. (empty)

Description: This warhead is point detonating with a short ogive nose welded a long cylindrical body. A short reducer couples the warhead to a 15 cm male propellant tube connection. The body of the warhead has been tapped and plugged at the girth.

Remarks: This item is similar to 583A. Photograph for that item shows external appearance.

583D-PROJECTILE, 24 cm. ROCKET, WARHEAD FOR

General:

Color: Black
Markings: In Japanese characters the date and arsenal markings near the ogive.
Components: Only the warhead was available for examination.
Dimensions: Diameter 24cm., Length of Warhead-18 inches (Less Fuze).
Weight: 48 lbs.

Description: This warhead is point detonating. It is threaded for coupling to a propellant tube similar to that for item 664 (q.v.). It is composed of a machined steel ogive welded to a machined steel cylindrical body. A reducing coupling is threaded to the cylindrical body and forms the rear of the warhead. The warhead was tapped and plugged.



584D-PROJECTILE. 24 cm., ROCKET

General:

Color: Black
Markings: None
Components: Warhead, warhead coupling, propellant tube,
jet tube and tail assemblies.
Dimensions: Length overall- 53 inches
Diameter 25 cm.
Weight: 93 lbs.

Description: The warhead on this rocket is identical with item 583B with the exception of it's coupling. In the instance of 583B the apparent coupling may in reality have been only a sleeve for the protection of the threading on the after end of the warhead. The warhead of this rocket is liquid filled. The fin and jet assembly is the same type as for 584B, but is much larger in size. The propellant tube is formed of a large heavy steel pipe.

Remarks: Composition of liquid filling is not known.



583C-PROJECTILE, 24.5cm., ROCKET, WARHEAD FOR

General:

Color: Black

Components: Only the warhead was available for examination and this warhead appeared to be lacking its ogive.

Dimensions: Diameter 24.5cm, Length of warhead 22 inches (reconstructed)

Weight: 35 lbs. (empty).

Description: The warhead did not have any ogive but a burster tube protrude beyond the body section and was threaded where the nose of the projectile would theoretically be. A roughly conical after section is inserted into the body section and terminates in a short male coupling (85 mm diameter) for the propellant tube.

Remarks: Filling unknown.



583B-PROJECTILE, 25cm., POCKET, WARHEAD FOR

General:

Color: Black
Components: Only the warhead was available for examination.
Dimensions: Length of warhead - 25" (less fuze),
Diameter of warhead - 25cm.
Weight: 60½ lbs. (warhead).

Description: This warhead has a short ogival nose into which a bursting well is set and, also, has a cylindrical body which terminates in a conical taper and joins a short female coupling of 85mm diameter. The coupling is for attachment to a propellant tube. The warhead is formed of heavy sheet steel welded and with all welds burred and finished.

Remarks: This warhead is liquid filled. The nature of the filling was not determined.



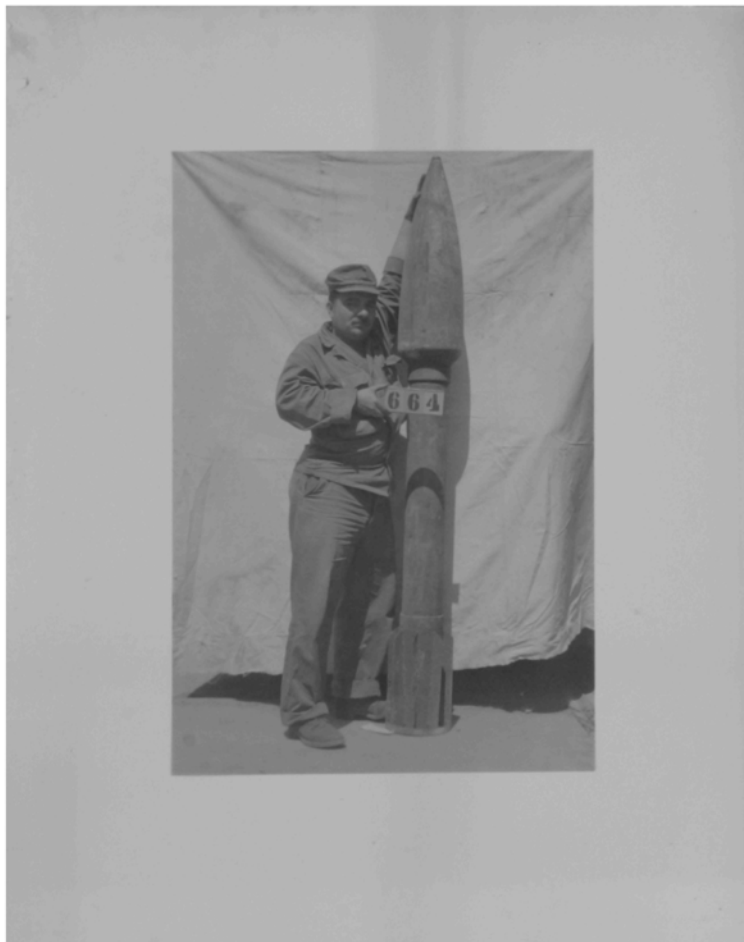
664-PROJECTILE 25 cm., ROCKET

General:

Color- Black
Components- Warhead, propellant tube, fin and jet assemblies.
Dimensions- Warhead Diameter-25 cm.
Warhead Length-33 inches
Overall Length-85 inches
Propellant tube diameter-6 inches
Weight- 150 lbs. (empty)

Description: This is a solid fuel type rocket fitted with a slenderly tapered steel, point-detonating warhead. The warhead is coupled to a heavy steel propellant tube. Attached to the tail end of the propellant tube is a jet chamber over which is fitted the tail fin assembly. The jet chamber is slightly tapered on its outside dimension and the fin assembly with its corresponding taper fits snugly upon it and is locked in place with a large lock nut. The fin assembly is a conical tube of welded sheet iron to which eight equally spaced tail fins have been welded. The fins are braced with a single hooped strut.

Remarks: It is estimated that the internal volume of the warhead is approximately 10 gallons. Filling for this projectile is not known.



584A-PROJECTILE, 38.5 cm., ROCKET, WARHEAD FOR

General:

Color: Black.
Markings: The Japanese character for "Short".
Components: Only the warhead was available for examination.
Dimensions: Length of warhead (less fuze) 30-3/4 inches.
Diameter of warhead 38.5 cm.
Weight: Of warhead 215 lbs. (empty).

Description: This warhead is point detonating. A machined steel ogival nose overlaps a machined steel cylindrical body which terminates in a male threaded base for attachment to a 15 inch propellant tube or coupling. This base is centrally plugged with a 4 1/2 inch insert disc for filling. The ogive has a small partial tap which may be intended to facilitate in mechanically grasping the warhead or otherwise handling.



644A-WARHEAD, ROCKET PROJECTILE, 90MM, CERAMIC

General:

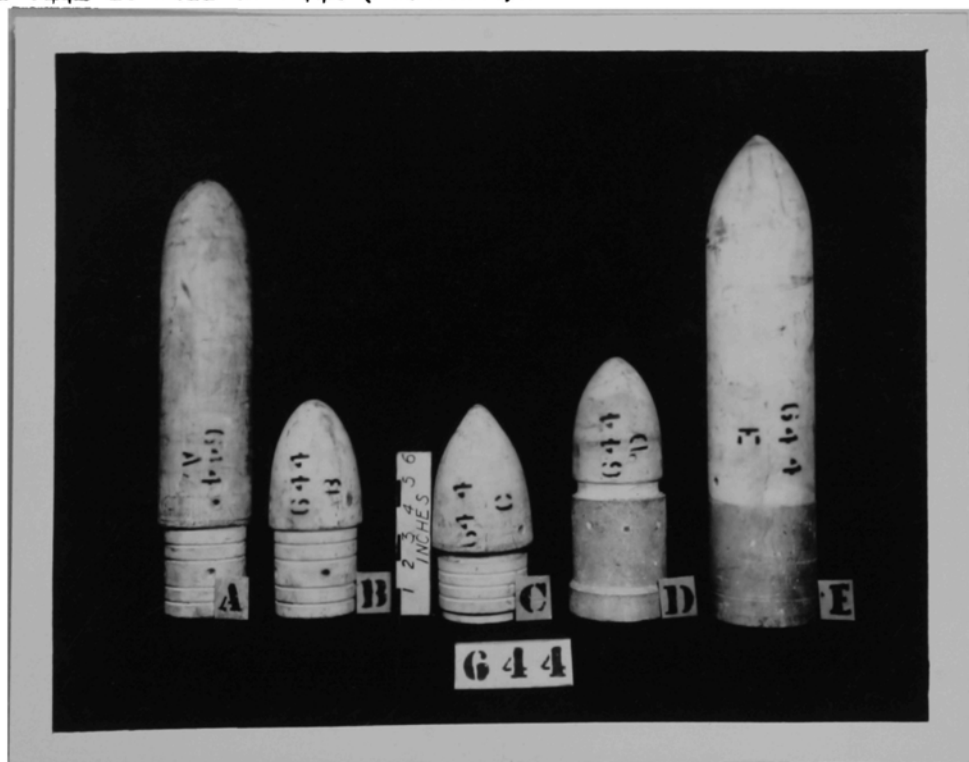
Color: White
Dimensions: 16-5/8" long, 90mm diameter (body).
Weight: 7 lbs. (empty).

Description: The intelligence group which located this item reported that it is the warhead of an experimental type rocket projectile. The propellant end of the projectile and the filling for the warhead were not available and nothing is known of these.

The warhead is a cast of ceramic material, has a short ogive. The base end of the warhead is of smaller diameter, 78mm, for insertion into a propellant casing. The base end is 3-3/8 inches of the total warhead length. There are 4 grooves in the periphery of the base sectionalizing the base into 4 bands, 2-1/2 inches, 1-1 inch and 1-1/2 inch in that order from the bottom. There are 4-3/8 inch diameter recesses evenly spaced around the 1 inch band. There are 2-5/16 inches diameter recesses diametrically opposite 11/16 inches from the bottom of the warhead. These conceivably serve the purpose of connecting the warhead to a coupling ring which is in turn joined to a propellant case. The internal volume of this warhead is approximately 36 ounces.

Remarks: Although sufficient material is not available to make definite conclusions, it is likely that the rocket warhead was to be filled with chemical agents. The rapid deceleration of the warhead upon impact could bring about considerable dispersion of the agent from within the easily smashed ceramic material.

Photograph shows rocket projectile warheads 644B, 644C, 644D, and 644E as well as 644A (marked A).



644B-WARHEAD, ROCKET PROJECTILE, 90MM, CERAMIC

General:

Color: White
Dimensions: 7-7/8 inches long, 90mm diameter.
Weight: 3 1/4 lbs. (empty).

Description: This warhead is a short modification of the type described as item 644A. It has a medium ogive, a rounded nose. The reduced tail section (77mm) is 3-1/8 inches long, has a set of bands as did item 644A. The approximate internal volume is 12 ozs.

Remarks: Photograph for 644A shows this warhead marked E.

RESTRICTED

644E-WARHEAD, ROCKET PROJECTILE, CERAMIC

General:

Color: White
Components: Ceramic warhead and metal coupling band.
Dimensions: 17 $\frac{1}{2}$ " long (overall), 98mm Diameter.
Weight: 10.6 lbs. (empty).

Description: This item is a part of a complete rocket projectile. The propelling charge and (rear) of the projectile was missing.

The warhead is made of a white ceramic material. It has a short ogive. It was reported from the collecting teams that the filling for the warhead was a chemical agent. Estimated filling capacity is .25 gallons.

The warhead is closed at its base end with a ceramic plug which screws into the 2-1/8 inch threaded opening.

A metal coupling band, 4-3/8 inches long, is joined to the tail end of the warhead and is held in place by lugs of the ceramic material which had been filled into holes in the band and the warhead.

Remarks: Photograph for 644A shows this item marked A.

644D-WARHEAD, ROCKET PROJECTILE, CERAMIC

General:

Color: white
Components: Warhead, metal coupling ring
Dimensions: 9 5/8 inches long, diameter of body varies from 91 to 99mm.
Weight: 4.7 lbs.

Description: ; This warhead differs from 644A to 644C in that it has a metal coupling ring attached to its base end. This ring is 4 3/8 inches long, has two threaded recesses on its base end. These are for attachment of the propellant end of the whole projectile. The warhead has a medium length ogive. It is of ceramic composition.

The interior of the warhead is wax coated. The estimated filling capacity of the interior is .1 gallon.

Remarks: Nothing is known about the type of filling intended for the warhead.

Photograph for 644A shows this item marked D.

644C-WARHEAD, ROCKET PROJECTILE, 100MM, CERAMIC

General:

Color: White
Dimensions: 8 inches long, 100mm diameter.
Weight: 3.2 lbs.(empty)

Description: This warhead, also a short modification of 644A, has the same characteristics as both 644A & 644B. Below are given the details of these characteristics which do differ from the warheads referred to above.

Nose: Medium ogive, pointed

Diameter of reduced tail section:

maximum: 88mm

minimum: 77mm

Width of bands on tail section: 3/8 inches.

Estimated internal volume of the warhead: 10 ozs.

Remarks: Photograph for 644A shows this item marked C.

582-WARHEAD, ROCKET PROJECTILE, PRESSED PAPER

General:

Color: White
Components: Warhead, metal coupling band.
Dimensions: 16-5/8" long, 98mm diameter.

Description: This item is part of a complete rocket projectile round. It consists of the warhead and the coupling band which would join the propelling charge end of the projectile to the warhead. The propelling charge end was not available for examination.

The warhead is made of pressed and impregnated paper. It has a short ogive. The base end is of smaller diameter and slips into the metal coupling ring which is $3\frac{1}{4}$ " (approx.) diameter, 4-5/16" long. The interior of the warhead is wax coated. It is estimated that the internal volume of the warhead is approximately .30 gallons.

The coupling ring is threaded inside on its open end probably to receive the propellant casing.

Remarks: This item may be intended for a chemical filling.



JAPANESE FUZES AND GAINES

These items are generally the common fuzes and gaines which are used in the large variety of Japanese bombs and projectiles. Designations of fuzes is by letter following the system listed below:

- "A" Series: Mechanical Impact Nose Fuzes
- "B" Series: Mechanical Impact Tail Fuzes
- "C" Series: Long Delay Time Fuzes
- "D" Series: Aerial Burst Fuzes

Within each letter designation, a number indicates a different type existing fuze.

Accompanying chart lists fuzes and gaines examined, showing dimensions and references.

~~RESTRICTED~~

CHART OF FUZZS AND GAINES

USNPD

ITEM	NOMENCLATURE		NO.	LENG.	WIDTH	REFERENCE
651	Fuze; Type 1 Instantaneous Nose	Army	A2(d)	2.7	1.6	JEO Figure 88
687	Fuze; Type 1, Mech. Impact Tail	Army	B1(b)	5.3	1.6	USNPD 118, 119
690	Fuze; Type 88; Instantaneous	Army		3.5	1.3	JEO Figure 231
691	Fuze; Type 88; Delay	Army		3.0	1.3	JEO Figure 232
692	Fuze; Type 91, Modif. 1, Time	Navy		3.0	2.3	JEO Figure 288
697	Fuze; Type 97 Mark 2 Model 2 Modif. Nose	Navy	A3(a)	5.5	2.1	USNPD 108, 109
698	Fuze; Type 99 Mark 3 Modif. Tail	Navy	D2(a)	5.9	2.4	USNPD 146, 147
701	Fuze; Type 99 No 25 Base	Navy	B2(a)	4.9	3.2	JEO Figure 160
702	Fuze; Type 100 Combination	Army		3.1	1.3	JEO Figure 233
703	Fuze; Type 3 8cm Mortar, Combination	Navy	A3(e)	3.2	1.3	JEO Figure 281
704	Fuze; Type 3 Nose Initiator	Navy	A3(e)	5.3	2.1	JEO Figure 157; USNPD 109g, 109h
705	Fuze; Type 5 Yr. Combination	Army		2.8	2.6	JEO Figure 237
706	Fuze; Type 15 Model 2 Modif. 1, Base	Navy	B3(a)	5.7	2.5	Modif. of JEO Figure 163 and USNPD 149, 150
707	Fuze, Mechanical Impact Nose	Navy	A3(b)	6.3	2.0	JEO Figure 154; USNPD 108, 109
693	Gainc, Type 92 Modif 2 Land Bomb	Navy		4.46	1.40	JEO p 121; USNPD 161
694	Gainc, Type 92 Modif 3 Land Bomb	Navy		4.46	1.40	
695	Gainc, Type 97 "A" Modif 1 Land Bomb	Navy		4.46	1.40	Modif. Of JEO p 121
696	Gainc, Type 97 "B" Modif 1 Land Bomb	Navy		4.46	1.40	Modif. Of JEO p 121
699	Gainc, Type 99 Mark 3 Modif 2	Navy		4.46	1.40	Modif. of JEO p 121
700	Gainc, Type 99 "A" Ordinary Bomb	Navy		4.46	1.40	JEO p 121

NOTE: REFERENCES USED ARE: "Enemy bombs and fuzes" U.S. Navy Bomb Disposal School Referred to as USNPD
 "Handbook of Japanese Explosive Ordnance" OPN.V 30-3M
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