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AUSTRALIAN MILITARY FORCES

TECHNICAL INTELLIGENCE SUMMARY

No. 18

COMPILED OCTOBER 1944

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AUSTRALIAN MILITARY FORCES

TECHNICAL INTELLIGENCE SUMMARY

No. 18

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JAPANESE EQUIPMENT

TYPE 100 RIFLE GRENADE DISCHARGER

Addendum to Report in AMF Tech Int Sum No.15

1. GENERAL

Further information has come to hand on the method of attaching the discharger to the rifles. Separate dischargers have also been recovered, for use with 6.5 mm and 7.7 mm rifles respectively.

2. DESCRIPTION (Figs 1 - 3)

The discharger is attached to a bayoneted rifle with the grenade discharger barrel located above the barrel of the rifle. The locking clamp is positioned around the barrel, the discharger slides over the clamp and the retaining pin is then pushed behind the hand guard of the bayonet. It is not necessary to remove the cleaning rod.

There are two different Type 100 Grenade Dischargers. One is for use with 6.5 mm Type 38 rifles and the other is used with the 7.7 mm Model 99 Rifle.

The main difference in the two dischargers is that the cartridge tubes are of different dimensions -

Inside Diameter	Thickness of Tube Wall
6.5 mm - 8.5 mm	1.15 mm
7.7 mm - 9.7 mm	1.75 mm

Other differences are in the locking pins and chains and sighting line.

On the discharger used with 6.5 mm rifle, the locking pin detent housing is on the left hand side of the discharger body and the locking pin is pushed from left to right. The reverse action applies to the discharger used with 7.7 mm rifle. The locking pin chain ring on the 6.5 mm discharger is triangular while that on the 7.7 mm discharger is circular. A vertical sighting line is located at the base of the 7.7 mm discharger body; there is no such sighting line on the discharger used with 6.5 mm rifle. It is thought that the gas port adjustment is not for the purpose of adjusting the discharger for use with two different calibres as apparently the dischargers can be interchanged and can be fired safely provided there is no restriction in the cartridge tubes.

(SOURCE:- A.C. OF S, G-2, USAFPOA)

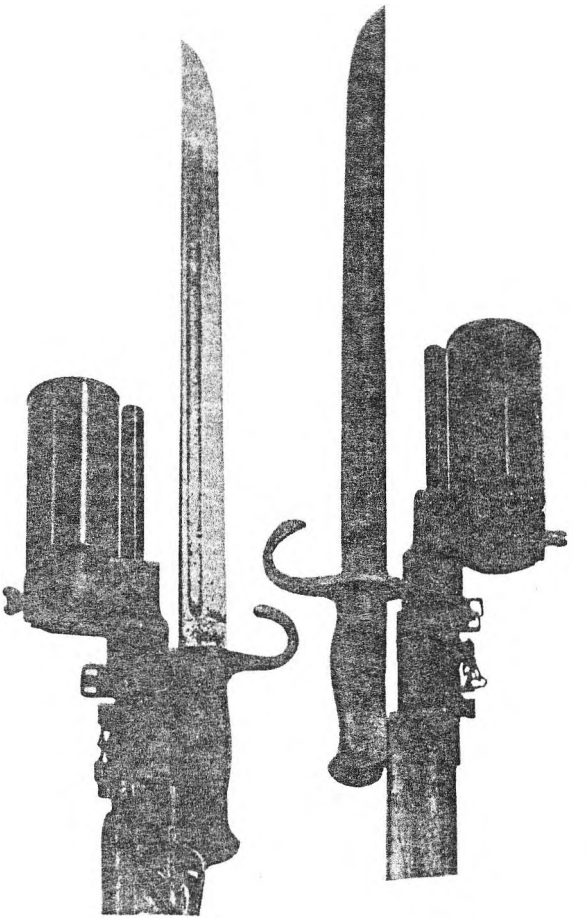
TYPE 100 RIFLE GRENADE DISCHARGER

FIG 1

Discharger attached to 7.7 mm Model 99 Rifle.

FIG 2

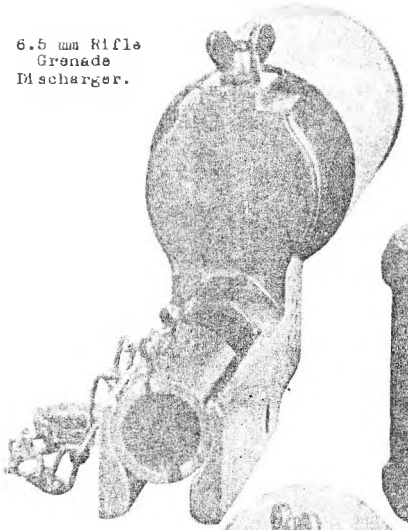
Discharger attached to 6.5 mm Model 38 Rifle.



TYPE 100 RIFLE GRENADE DISCHARGER

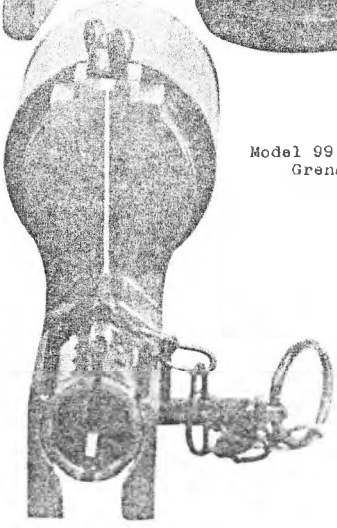
FIG 3

6.5 mm Rifle Grenade Discharger.



7.7 mm Rifle Grenade Discharger.

(Note Right-Hand Locking Pin, and Sighting Line.)



Model 99 Grenade.

81 MM MODEL 3 MORTAR

1. GENERAL

This weapon is the 1928 model and is definitely inferior to the later development namely model 97 mortar. The mortar examined was recovered in the Marshalls and had markings which are translated as follows:- "Model 3 8 cm Trench Mortar - Made in 1943 - Yokosuka Navy Arsenal".

2. DESCRIPTION (Figs 1 and 2)

The Model 3 mortar differs from the later model 97 mortar in the following respects:-

(a) A heavier base plate is used and appears to be identical with that used with the 90 mm Model 94 Mortar. The model 97 base plate can be used with model 3 mortar.

(b) The barrel is of the same length as the model 97, but two collars are machined on the forward portion of the barrel to secure the bipod clamp.

(c) The bipod is constructed of light weight tubing. There is no cross-levelling device in evidence; rough cross-levelling adjustments could be made by breaking the bipod support and moving the leg on the low side inwards.

(d) The thread employed in the traversing and elevating mechanism is of the square type rather than the efficient buttress type as used on the model 97.

(e) No sight was recovered with the mortar - model 97 sight will not fit the model 3 sight bracket.

(f) The mount is very unstable.

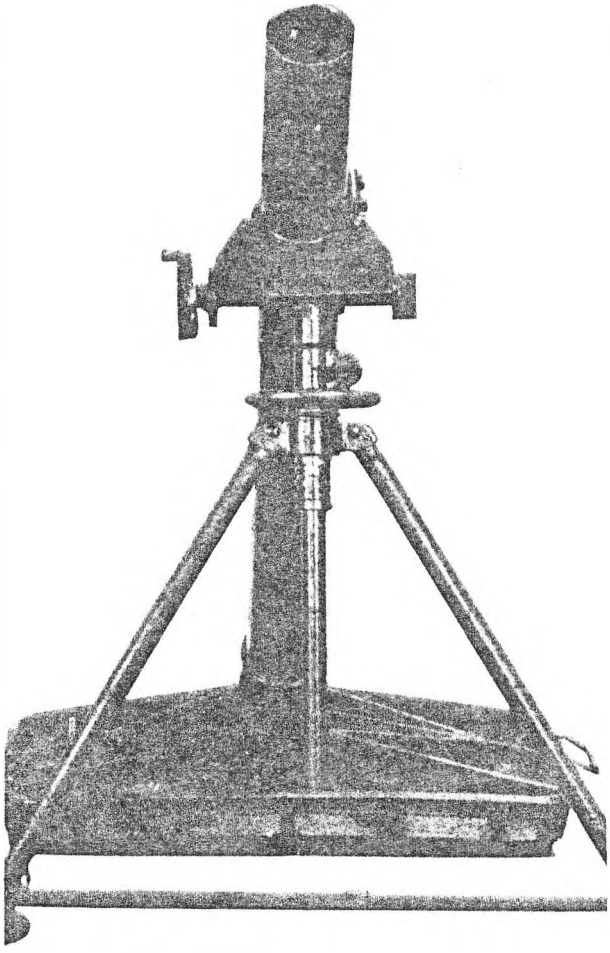
(g) The model 3 mortar weighs 167 lbs made up as follows:-

Base plate	95 lbs
Barrel	47 lbs
Bipod	25 lbs

(SOURCE:- A.C of S, G-2, USAFPOA)

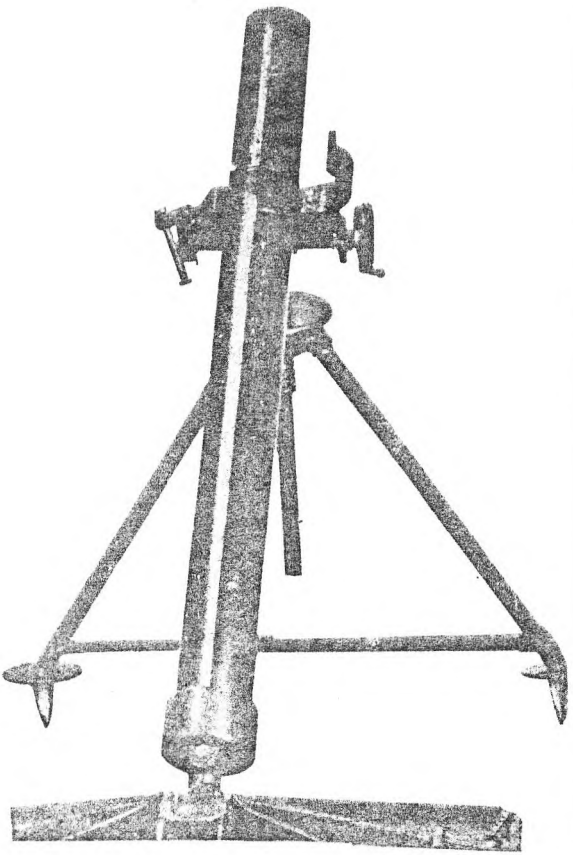
81 MM MODEL 3 MORTAR

FIG 1



81 MM MODEL 3 MORTAR

FIG 2



FLASH HAND GRENADE

1. GENERAL

The use of this grenade is not definitely known although it is probably thrown from an aircraft at night to dazzle an attacking pilot. The short time of delay to functioning (2 seconds) and the absence of designed anti personnel effect suggest that it is not intended for use as an infantry weapon. Reference to an air burst in the translation of a printed label gummed to the grenade handle tends to support the above theory. The grenade may be readily identified by its black colour, the paper construction and the shape.

2. DESCRIPTION (Figs 1-4)

The grenade consists of a handle pellets and a body.

(a) Handle: This component consists of a tube made of brown paper rolled longitudinally and is attached at its inner end to the end of a shaped beechwood block by means of four 10 mm flatheaded brads. The cylindrical end of the wooden block which fits inside the handle is 42 mm in diameter, 15 mm long and has an axial perforation 20 mm in diameter and 16 mm deep. The central flange is 56 mm in diameter and 5 mm thick. The cylindrical end housing the friction igniter is 18 mm in diameter, 10 mm long and has an axial perforation 7 mm in diameter.
The friction igniter is of the same type as that used with the Japanese Stick Grenade and is described as follows:- The igniter body consists of a drawn tube of 30 SWG brass closed at one end and opened out at the other by slitting in two directions to a depth of 5 mm and bending out the four lugs so formed. A 1 mm perforation in the closed end of the tube allows the cord to pass through to the interior of the igniter. The end of the tube is covered with a nitro-cellulose lacquer to waterproof the perforation. Inside this end of the tube is a rolled paper cylinder, closed at one end by a disc of red fibre having a central perforation through which the cord passes. In this cylinder is the igniting compound in the form of a truncated cone, axially perforated to take the cord. A qualitative analysis indicates the presence of potassium chlorate strontium nitrate, antimony sulphide and zinc (probably as metal). The end of the cord is coated with a small quantity of a friction composition of the red phosphorus type. Two diametrically opposed vent holes, 4 mm diameter, are drilled in the brass tube 23 mm above the closed end and are covered and waterproofed by a length of tinfoil attached by shellac to the exterior. A cambelure is rolled into the tube above the vent holes and serves as a stop for the delay train.
The igniter is inserted into the wooden block and is secured by two small flatheaded steel brads driven through diametrically opposed lugs. The cord made of undegummed natural silk is 110 mm long and is tied at its outer end to an iron wire ring 27 mm in diameter.

This ring is attached to the interior of the handle by two strips of gummed paper. The delay train consists of a 15 mm length of safety fuse with a gunpowder pellet at each end and is wrapped in a sleeve of white paper. The length of the delay train is considerably less than that in the Stick Grenade (26 mm) and would give approximately half the delay period which agrees with the two second delay mentioned in the label on the handle. The bursting charge of the grenade is contained in a bag of pure silk attached to the inner end of the handle. The bag is made in the form of a cylinder 155 mm long and 56 mm in diameter, one end of which is slipped over the flange of the wooden block and bound to the inner end of the cardboard handle by six turns of thread. Cuts 10 mm long are made at 6 mm intervals in this end of the bag and the flaps so formed are turned back and subsequently attached to the interior of the grenade body.
The bursting charge consists of 127.5 gms of granular gunpowder and is inserted into the bag, the end of which is tied by three turns of thread. The silk bag had been given an external coating of a gunpowder priming.

(b) Pellets: Thirty-two pellets surround the bursting charge. The pellets are in five rows and are distributed as follows:-

Row 1	(nearest the handle)	8 pellets
" 2		8 "
" 3		4 "
" 4		9 "
" 5	(at base)	3 "
		32 "

Each pellet consists of a cylindrical cup 26.5 mm in diameter and 20 mm long pressed from 30 SWG tin-plate and closed by a cupped tin-plate lid of the same gauge. The lid is secured to the cup by a folded joint. The cup is lined with paper and into the base is loosely pressed a 10 mm layer weighing 7.3 gms of a flash-producing pyrotechnic composition consisting of the following:-

Potassium nitrate	55.5%
Antimony sulphide	9.5%
Free sulphur	16%
Aluminium (metal)	19%
	100%

A wooden disc, 25.5 mm in diameter and 5 mm thick, is attached to the underside of the tin-plate lid by a black nitrocellulose lacquer. A central 5 mm diameter perforation in the lid and disc takes a 20 mm length of safety fuse. This is coated at both ends by a priming composition containing potassium nitrate, charcoal and sulphur to form a thick surround on the end adjacent to the pyrotechnic mixture. A length of primed paper is threaded through the fuse 10 mm from the end. The pellets are packed with the primed fuse in contact with the bursting charge to secure ready ignition. A thin rolled paper sleeve fitting over the cylindrical walls of the pellet and a paper disc covering the base are retained by patches of a black nitrocellulose lacquer. The space between the pellets in

the assembled grenade is packed by a material consisting wholly of the "hirsute pericarp of Gossypium herbaceum" (the upland cotton). This is the waste material left after the removal of the cotton fibres and the seed from the boll of that plant.

(c) Body: The spherical body of the grenade is made of pasted paper, mainly newspaper and other printed paper, built up to a thickness of approximately 5 mm in two concentric layers, a lining and an outer covering.
The lining is approximately 3 mm thick and has been built up from paper gummed together over a spherical former. A 49 mm diameter hole is left at one end to take the handle. The lining is removed from the former in three sections by cutting in planes perpendicular to the axis of the handle, the first cut removing a spherical segment from the base and the second removing a spherical zone. The segment and zone together make up a hemisphere.
The handle, complete with bursting charge, is passed through the hole in the hemispherical top of the lining and the silk flaps at the top of the silk bag are gummed to the inside of the lining. A ring made from long cellulosic fibres is slipped over the handle and helps to secure the handle to the lining.
The first, second and third rows of pellets together with the surrounding packing are assembled into the grenade at this stage.
The next section of the lining (the zone) is replaced and secured to the hemispherical top by gummed paper.
The fourth and fifth rows of pellets are added and the packing over the base of the grenade is inserted, wrapped in a paper sheet. The lining is complete and the grenade is filled on replacing the last section (the segment). The 2 mm thick outer covering over the lining is then pasted on, followed by a final covering of strips of gummed paper. A collar, which consists of a paper strip with one serrated edge, is attached at the junction of handle and body with the serrations gummed to the grenade body.
The grenade is coloured black externally and a label is attached to the handle. The presence of a cover over the end of the handle is inferred from the translated label and from the uncoloured end of the handle.

(d) Characteristics: Other dimensions and weights are as follows:-

Overall length	230 mm	
Diameter of body	138 mm	
Length of handle from junction with body	90 mm	
Total length of handle	115 mm	
Diameter of handle	48 mm	
Thickness of wall of handle	3 mm	
Diameter of pellet	26.5 mm	(29.5 mm at rim)
Weight of complete grenade	983 gm	
Weight of complete pellet - Average ..	18.7 gm	
Minimum ..	17.9 gm	
Maximum ..	19.2 gm	

3. MARKINGS

A printed label gummed to the handle of the grenade is translated:-
"Directions for use.

Remove the cover on the handle and pull out the ring on the cord. Grasp the handle and throw without delay. The charge explodes about two seconds after it is ignited by the cord and numerous explosive containers are scattered in the air. Each container explodes individually.
September 1942. Made in Tokyo Number One Army Arsenal, Number three factory.
Inspection Stamp - Tokyo " (B) "

The date on the second grenade examined was given as August 1942. The ideograph is literally translated as "Fire".

4. ACTION OF GRENADE

The pulling of the iron wire ring attached to the cord initiates the friction igniter and lights the delay train. After two seconds the bursting charge explodes, shattering the body and scattering the pellets and at the same time igniting the pellet delay trains. Each pellet explodes with a sharp report and a bright flash approximately one second afterwards.
Owing to the central position of the bursting charge, the pellets are scattered in all directions, and the area covered by the exploding pellets must be considerable. Assuming that the grenade is used for its dazzle effect, and not as a signal, the effect of its bursting in the line of sight of a night fighter pilot would be to form a persistent patterned image which would prevent concentration on his target.

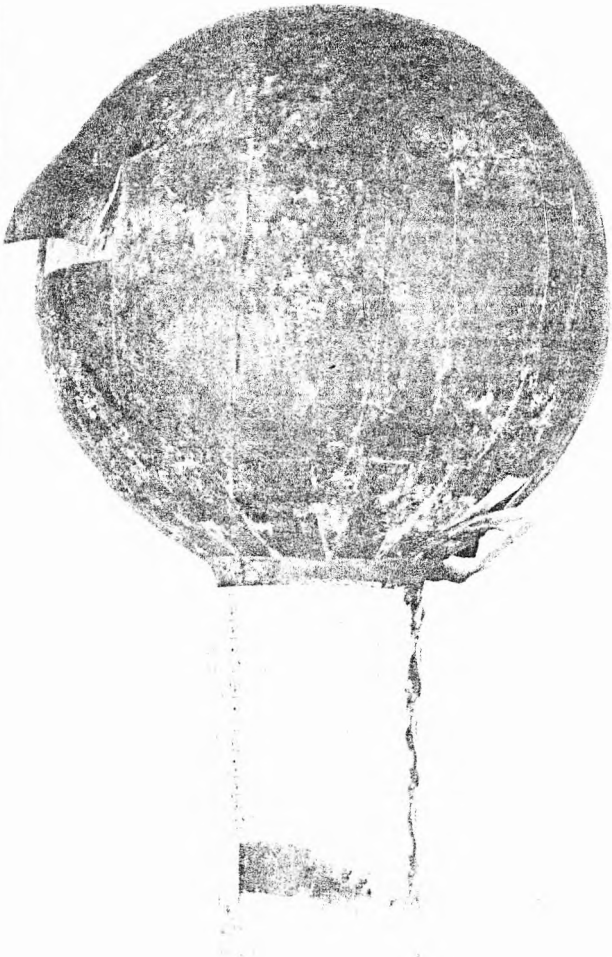
5. CONDITION

No waterproofing is applied to the grenade. In the specimen examined moisture had entered and affected all parts including the interior of the pellets. The gunpowder bursting charge was caked and had begun to lose its granular structure, and the tinplate pellets were rusted in patches. Some mould growth had occurred in the paper body.

(SOURCE:- MUNITIONS SUPPLY LABORATORIES through MGO Staff)

FLASH HAND GRENADE

FIG 1



FLASH HAND GRENADE

FIG 2

Handle with Gunpowder Burster in Silk Bag.

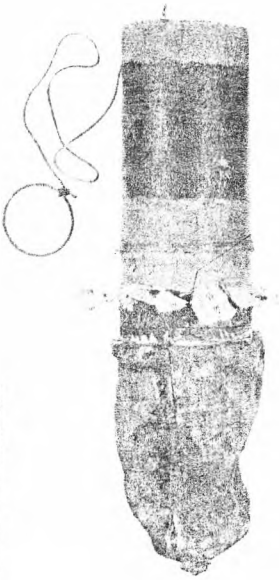
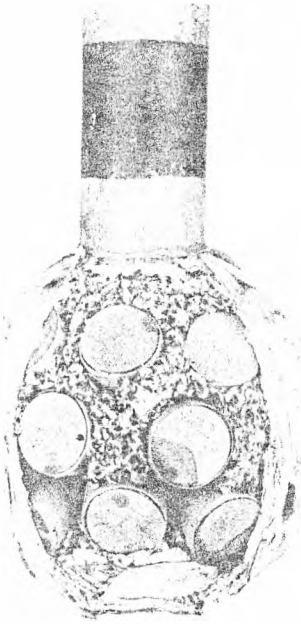


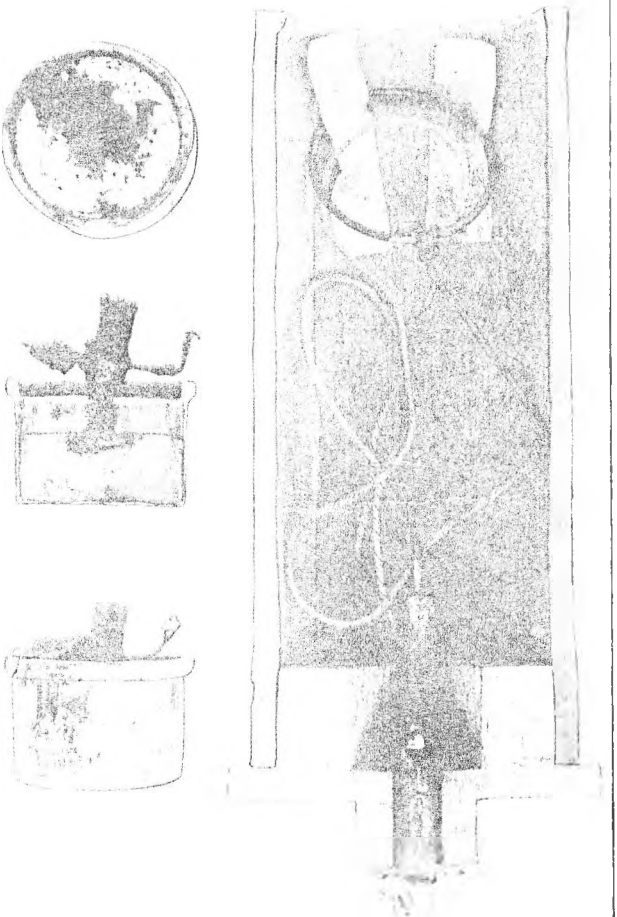
FIG 3

Interior of Grenade.



FLASH HAND GRENADE

FIG 4 Pellets (One Sectioned), and Section of Handle.



GRENADE FRAGMENTATION TESTS

1. GENERAL

Tests were conducted to ascertain fragmentation of Type 91 Grenade, Type 89 50 mm Grenade Shell and Stick Grenade. This information is in addition to that contained in AMF Tech Int Sum No. 10 "Fragmentation Tests Cast Iron Grenades" which gave some details of fragmentation of Type 91 Grenade and Type 89 Grenade Shell.

2. PREPARATION AND METHOD

The type 91 grenade and the stick grenade were prepared for firing by inserting an electric fuse head into a quantity of gunpowder placed over the original detonators. A hole was drilled into the fuse body of the type 89 shell in which a commercial No. 6 electric detonator was placed to initiate the existing fuse gains. Each grenade was detonated in a cardboard lined cavity in the centre of a drum of sand. The cavities were of larger diameter than the grenades, leaving air spaces around the grenades except at the bases where they rested on the sand. The fragments were recovered by sifting through a 10 mesh sieve and a magnet was used to recover the smaller magnetic fragments.

3. RESULTS (Figs 1 - 5)

(a) Type 91 Grenade: Weight of metal parts of grenade 465.5 gms, weight of bursting charge 58 gms. The bursting charge consisted of pressed crystalline T N T. The metal components were a cast iron body, brass fuse and copper tube surrounding delay train and detonator.

Component	Weight Class (oz)	Number of Fragments		Total Weight of Fragments (gms)	
		Rd 1	Rd 2	Rd 1	Rd 2
Propellant container	above 1/8	1	1	87.8	86.9
Body	1/8 - 1/25	29	11	48.7	11.1
	under 1/25	1582	1544	224.8	219.3
Copper tube	under 1/25	3	3	0.45	0.60
Brass fuse	1/8 - 1/25	7	8	16.1	22.9
	under 1/25	19	15	7.6	4.6
				385.5	345.4
Percentage recovery				82.8%	74.2%

(b) Stick Grenade: Weight of metal parts of Grenade 382 gms, weight of bursting charge 75 gms, nature of

bursting charge - pressed powdered picric acid.

Component	Weight Class (oz)	Number of Fragments	Weight of Fragments
Body (cast iron)	¼-⅛	2	8.1 gms
	⅛-1/25	35	58.6 gms
	under 1/25	1733	271.2 gms
			337.9 gms
		Percentage recovery	88.5%

(c) Type 89 50 mm Grenade Shell: Weight of metal parts of shell 639 gms, weight of bursting charge 145 gms, nature of bursting charge - Pressed crystalline T N T.

Components	Weight Class (oz)	Number of Fragments in each Class		Fragment Weight (gms)	
		Rd 1	Rd 2	Rd 1	Rd 2
Steel body	2 - 1	1	1	50.6	75.8
	1 - ½	2	3	38.9	47.3
	½ - ¼	21	21	207.1	200.8
	¼ - ⅛	21	27	99.3	140.5
	⅛ -1/25	50	29	93.5	54.6
	under 1/25	223	211	63.3	39.3
Copper driving band	¼ - ⅛	-	2	-	6.5
	⅛ -1/25	11	6	16.4	10.0
	under 1/25	25	32	5.0	7.8
Brass fuse	¼ - ⅛	1	1	3.6	3.9
	⅛ -1/25	7	2	11.3	4.9
	under 1/25	131	135	34.7	25.0
				623.7	616.4
		Percentage recovery		97.6%	96.5%

4. SUMMARY

All grenades were completely detonated. The type 91 grenade and stick grenade gave comparable fragmentation and percentage recovery. The bodies of both were made of cast iron and the fragmentation into a large number of small pieces is typical of this material.
The steel body of the type 89 shell fragmented with a high percentage of larger pieces showing a characteristic 45° shear at the edges. The percentage recovery was higher than that of the other two types.
In the following table, the percentage of the total weight is tabulated for pieces in each category and where two grenades were fired, the average was taken.

Type 89 Grenade Shell (%)		Type 91 Grenade (%)	Stick Grenade (%)
Body 1 - 2 oz	(1.0	(Cast Iron)	(Cast Iron)
½ - 1	(6.8		
¼ - ⅛ Steel	(31.9		2.1
⅛ -	(18.8		
1/25- ⅛	(11.6	6.5	15.3

Type 89 Grenade Shell (%)		Type 91 Grenade (%)	Stick Grenade (%)
Driving Band (copper) $\frac{1}{8}$ - $\frac{1}{4}$ oz	0.5		
1/25- $\frac{1}{8}$	2.1		
Fuse (brass) $\frac{1}{8}$ - $\frac{1}{4}$ oz	0.6		
1/25- $\frac{1}{8}$	1.3	4.2	
Propellant container	-	18.8	
Fragments < 1/25 oz	25.4	70.5	82.6

(SOURCE:- MUNITIONS SUPPLY LABORATORIES through MGO Branch)

NEW TYPE BOMB CANISTER

Addendum to Report in AMF Tech Int Sum, No 10.

The Canister described in the above report has been reported in error. The Mistake occurred because the nose portion of one canister and the sides of another were received from the field as parts of a single bomb.

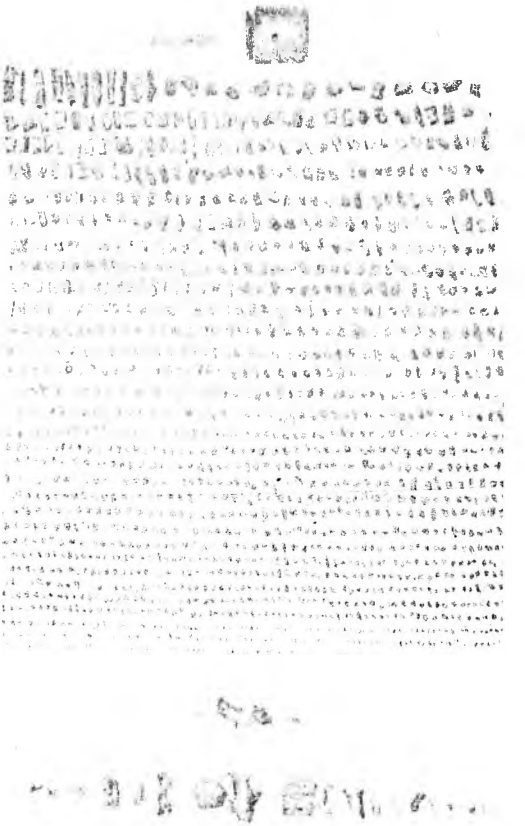
(SOURCE:- M E I U)

GRENADE FRAGMENTATION TESTS

FIG 1 Type 91 Grenade, Round 1.

GRENADE FRAGMENTATION TESTS

FIG 2 Type 91 Grenade, Round 2.

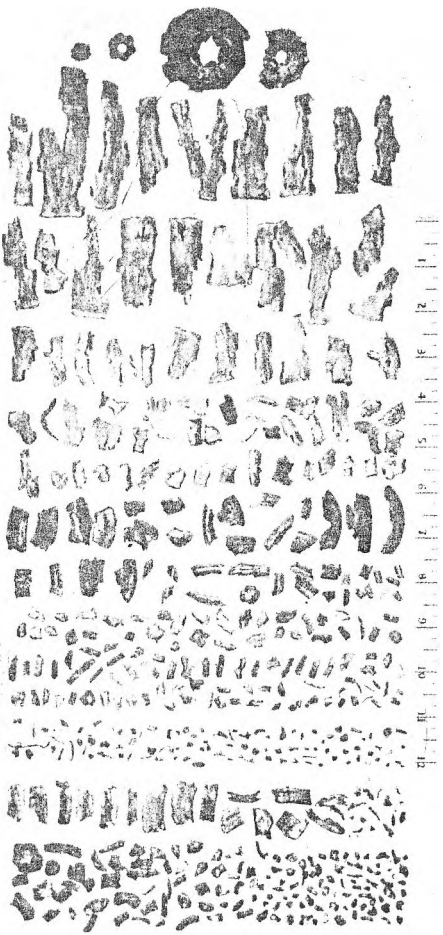


GRENADE FRAGMENTATION TESTS

FIG 3 Stick Grenade.

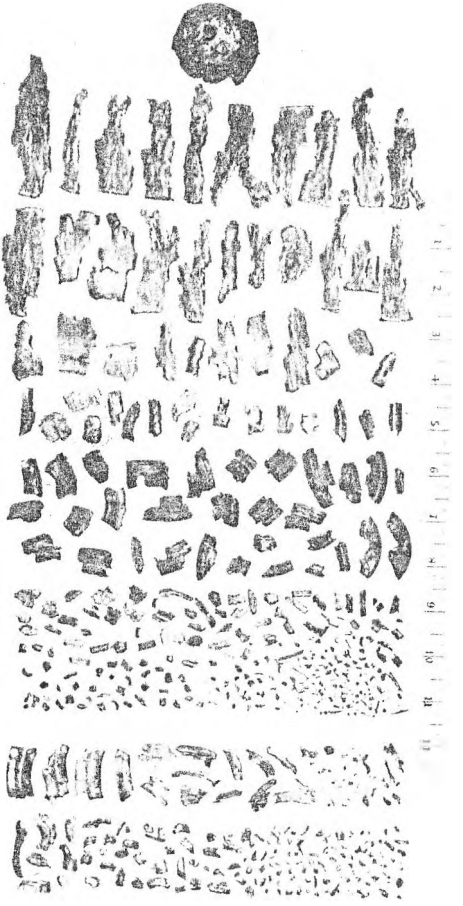
GRENADE FRAGMENTATION TESTS

FIG 4 Type 89 Grenade Shell, Round 1.



GRENADE FRAGMENTATION TESTS

FIG 5 Type 89 Grenade Shell, Round 2.



50 KG TYPE 100 INCENDIARY BOMB

1. GENERAL

The bomb examined was identified as used by naval air force and employs impregnated rubber pellets as the incendiary agent.

2. DESCRIPTION (Figs 1-6)

The bomb consists of a nose piece, body, tail cone and fins, explosive and incendiary fillings.

(a) Nose piece: The nose piece is drilled and threaded to receive the nose fuse (30 mm major diameter, 2.C mm pitch, (right hand), the fuse being held in position by two diametrically opposed grub screws. Three dowel pins screw through evenly spaced holes in the base of the nose piece and engage corresponding holes in the forward end of the body.

(b) Body: The cylindrical steel barrel fits, at the forward end, into a shaped steel bulkhead and at the rear end into the tail cone. The joints are sealed by continuous fillet welds. A 20 mm wide carrying band encircles the barrel and is welded to it at intervals. The ends of the band are bolted to an army type, hinged suspension lug.
The steel bulkhead at the front of the body is centrally perforated and threaded to receive a screwed burster container. It was not possible to unscrew the burster container due to the presence of sealing composition in the threading.

(c) Tail Cone and Fins: The tail cone has a domed end and to it are attached four tail fins by means of four welds on each. There is a clearance between the fins and the end of the tail and no weld is present at this point. The fins are welded to each other along the axis of the bomb and are braced at the tips by a wide strut welded to them. Shallow recesses are formed in the edges of the fins to take the bracing struts and ensure that the diameter over the struts is the same as the diameter over the fins.

(d) Explosive Filling: This consists of three preformed picric acid blocks, all wrapped in yellow paper. Two blocks coated with paraffin wax are located in the nose and the third fills the burster container in the barrel.
The first block is a cylindrical exploder of powdered picric acid pressed in a graphited mould with an axial recess in the end to accommodate the fuse magazine. The dimensions and weight of this block are as follows:-

Weight	63.7 gms
Length	30 mm
Depth of recess	20 mm
Diameter of recess.. ..	12 mm
Diameter	45 mm

This block bears markings translated as "yellow colour" meaning picric acid, a grenade stamp, probably the filling factory stamp and 16.7, indicating date of manufacture as July 1941.
The second block is much larger and is the main bursting charge of the nose. It is in the form of a truncated cone with a cylindrical recess at the forward end to house the exploder. The block is of cast picric acid, weighs 840 gms and has the following dimensions:-

Length of side	69 mm
Diameter of base	147 mm
" " top	70 mm
Axial height	58 mm
Depth of recess	15 mm
Diameter of recess	46 mm

A cardboard disc covering the base of the block separates it from the forward end of the bulkhead.
The interpretation of printed markings on the block is as follows:- Type 100 50 Kg Incendiary (Bomb) No. 1 Burster (charge) Yellow Colour (Picric Acid) Grenade Stamp (probably stamp of filling factory) 16.6 (date of manufacture - June 1941).
The third block is cast picric acid cylindrical in shape and fills the burster container in the barrel. It weighs 1666 gms, is 434 mm long and 55 mm in diameter. Printed markings are the same as those on the second block except that this is No.2 burster and date of manufacture is given as May 1941.

(e) Incendiary Filling: The bomb contained 34 lbs 3 ozs of a composite filling consisting of 427 cylindrical black rubber pellets surrounded by 5.2 litres of a heavy golden yellow liquid having the composition:-

White phosphorus	70%
Carbon Bisulphide	30%

The liquid has a strong odour of carbon bisulphide and develops a pale yellow opalescence on standing in clear glass bottles due to the decomposition of the carbon bisulphide by light.
The pellets, when freshly removed from the bomb, measure approximately 25 mm by 25 mm and are impregnated with the above mixture to the extent of 90% of their original unimpregnated weight. Fully impregnated, they weigh between 15 gms and 17 gms each. It is evident that the pellets have been made from 20 mm diameter rubber cord roughly sliced into 20 mm lengths. The chemical examination of the rubber pellets revealed the absence of sulphur and halogens thus indicating that they are made from unvulcanised rubber; the presence of small quantities of fillers indicates some degree of compounding. These fillers consist of both carbon black and inorganic material, spectrographic analysis of the ash of which shows zinc, silicon and iron to be present as major elements, with traces of aluminium and magnesium.

(f) General Characteristics:

Overall length	1029 mm
Length of body	839 mm
" " nose piece	197 mm
Diameter of barrel	181 mm
" " tail cone (max)	187 mm
" across tail fins	250 mm

Length of nose (along axis)	125 mm
" " tail cone (along axis) ..	241 mm
Thickness of barrel	3 mm
" " tail cone	3 mm
" " " fins and struts ..	2 mm
Width of tail struts	41 mm
Internal length of burster container	440 mm
" diameter of " "	56 mm
Distance of suspension lug - ..	
from tail	623 mm
from nose	406 mm
Weight of complete bomb (without fuse)	45.9 Kg
" " empty bomb	27.8 Kg
" " explosive filling	2.6 Kg
" " incendiary filling	15.5 Kg
Charge/weight ratio - explosive ..	5.5%
" " " - incendiary ..	33.86%
" " " - total filling..	39.4%

3. COLOUR AND MARKINGS

The body is painted blue-grey.
A 20 mm band of white paint is located in front of the carrying band and a 50 mm Greek Cross in white paint is at the rear of the suspension lug. Two white 40 mm characters, indicating an incendiary filling, are respectively 90 mm and 130 mm forward of the carrying band and in the plane of the suspension lug."50 K" in 30 mm white figures indicates the weight of the bomb and is 180 mm forward of the carrying band in the plane of the suspension lug. Stamped into the metal on the bulkhead, burster container and in adjacent positions on both nose and barrel is "791" in 6 mm figures.

(SOURCE:- MUNITIONS SUPPLY LABORATORIES through MGO Staff)

50 KG TYPE 100 INCENDIARY BOMB

FIG 1

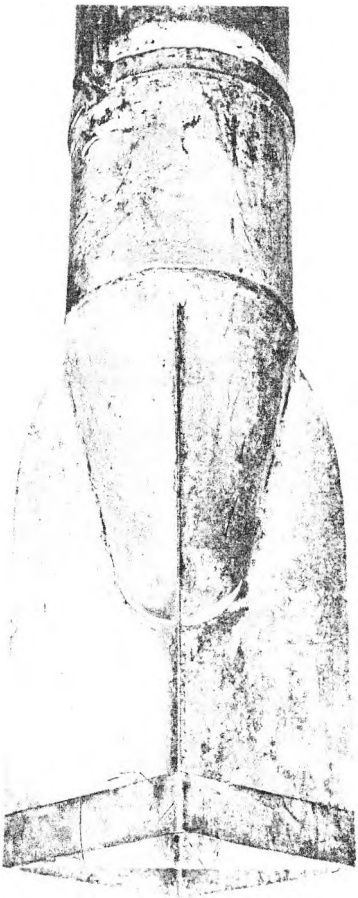
50 KG TYPE 100 INCENDIARY BOMB

FIG 2 Burster Charge & Top of Exploder, Nose Piece Removed.

FIG 3 Upper Burster Charge & Exploder Removed.

50 KG TYPE 100 INCENDIARY BOMB

FIG 4 Tail Cone and Fins.



50 KG TYPE 100 INCENDIARY BOMB

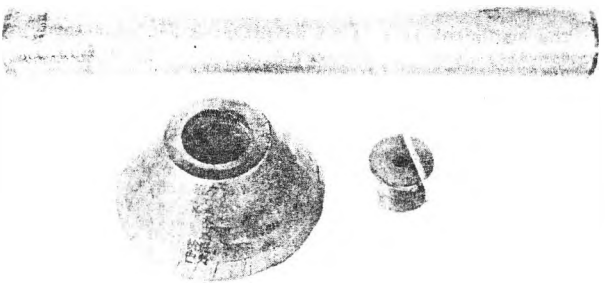


FIG 5 Bursting Charges & Exploder.

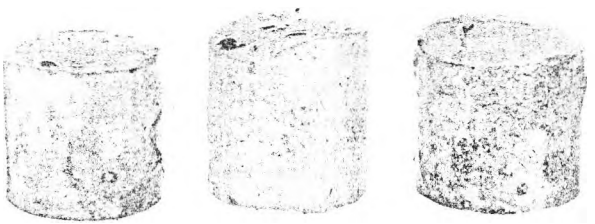


FIG 6 Three Black Rubber Pellets as removed from Bomb. (Actual Size.)

TYPE 93 4 CM SELF PROJECTING SIGNAL FLARE

1. GENERAL

Two types of self projecting flares recovered in New Guinea were (a) triple white shooting star flare and (b) green parachute flare.

2. DESCRIPTION (Figs 1-3)

(a) Triple White Shooting Star Flare: This flare can be divided into three main components, namely (i) projector, (ii) projectile and (iii) igniter and propellant system. The main weights and dimensions are:-

Total weight	262 gms
Weight of Projectile	100 gms
Weight of each Flare Pellet	18.5 to 18.6 gms

Length Overall	18.2 cms
Length of Projectile	9.3 cms
Diameter Overall	4.4 cms
Diameter of Projectile	4.1 cms

(i) Projector: The metal cylinder which serves both as container and "barrel" is constructed from approximately 28 SWG tinned iron with a neat tightly pressed hooked seam soldered down the outside and more lightly within. The cylinder is coated with a clear golden varnish inside and outside. A white paper label on the outside is 11.4 cms long and 6.0 cms wide. The top of the cylinder is closed by means of a disc of thin white cardboard retained in position by a 3 cms wide strip of brown paper. The upper portion of the paper had been fringed to a depth of 1.3 cms by a series of cuts approximately 0.5 cms apart. The entire portion is glued around the outside of the metal cylinder forming a band 1.7 cms wide, with the fringed portion folded in and glued to the top of the disc. A circular piece of brown paper is glued over to cover the fringe. The top covering of the projector is coated thickly with paraffin wax, which also extends down the sides for an average distance of 2.5 cms. Within the upper end of the metal cylinder is a 3.0 cms wide piece of thin white cardboard folded to form a spacer triangular in section. A thin white cardboard disc separates the spacer from the top of the projectile.
The lower portion of the projector appears to have been dipped into paraffin wax to a depth of 4.0 cms. Holding the slip-on cover at the base in position is a 3.0 cms wide brown paper band and beneath this is a 1.2 cms wide strip of cotton tape. The slip-on base 2.25 cms long is pressed from the same material as the cylinder. Its removal showed the lower end of the cylinder to have four broad triangular teeth approximately 2.1 cms long. A more or less U-shaped length of safety fuse wrapped in brown paper along one arm, a wad of cotton waste and an octagonal striker block wrapped in brown paper were also apparent.
Six 1.0 cm long tacks through the cylinder hold in

place a turned wooden block 3.3 cms long, its base just showing below the apices of the gaps between the teeth. The top of the block is covered by a piece of glued-on waxed paper and contains a charge of black powder in a depression 1.15cms deep and 3.0 cms in diameter. Through the central axis of the block is a 0.5 cm diameter hole containing portion of the safety fuse. Across the base is a radial groove 0.6 cm wide and deep. The fuse is held in the groove by two tacks about half way along it. Opposite the end of the groove is a similar sized opening cut out of the metal cylinder at the apex of one of the gaps between the teeth.

The upper end of the safety fuse is in contact with the charge in the wooden block. A thin brass tube 1.5 cms long and containing the match head in one end, is crimped on to the lower end of the fuse. A 0.2 cm diameter gas port covered by a strip of 0.5 cm wide waxed paper is present in the tube opposite the gap between the match head and end of the safety fuse. Above the wooden block are two discs, each with a 1.5 cm diameter hole in the centre. One disc is of thin white cardboard, the other of coarse brown felt 0.6 cm thick. The base of the projectile rests upon the felt disc.

The wooden striker block is 0.55 cm thick, eight sided and appears to be a 2.0 cms square with four corners cut off to form additional short sides. Through the centre is a 1.3 cms diameter hole. The four longer sides are covered with red phosphorus and abrasive.

(ii) Projectile: Several layers of thin white card, compressed together, form the approximately 2.75 cms thick tubular body of the projectile. The outside is covered by a layer of pale brownish paper. The top is closed in a similar manner to the projector, with first a circular piece of brown paper, then a 2.6 cms wide strip of the same material, the entire portion of which formed a 1.4 cms wide band, and finally a white cardboard disc. In addition, however, is a 0.2 cm thick disc of brown cardboard which fits in to the top of the projectile and is glued to the lower surface of the white disc.

A turned wooden block is fitted in to the lower end of the tubular body of the projectile, and is held in position by means of glue and five 1.0 cm long tacks. Covering the junction of the lower portion of the block and cardboard tube as well as the heads of the tacks is a 2.1 cms wide band of brown paper. Through the central axis of the block is a 0.5 cm diameter hole containing a length of delay fuse, notched at the lower end, which projects for 0.5 cm below the base of the block. To the top of the block is glued a circular piece of waxed paper, beneath which is a charge of black powder in a depression 1.7 cms diameter and approximately 0.3 cm deep. A channel of the same depth runs out from the margin of the depression, where it is 0.9 cm wide, to the edge of the block, where it is 1.4 cms wide. The waxed paper is glued to the base of this channel to prevent the charge from escaping into it.

Glued longitudinally to the inside of the body of the projectile are two tight rolls of brown paper, approximately 0.5 cm in diameter and 5.7 cms long, one to each

side of the channel in the top of the wooden block. Measured around the inside wall of the projectile the rolls were approximately 3.5 cms apart.
Resting on top of the wooden block is a thin white cardboard disc 2.9 cms in diameter and above this a brown felt disc of the same diameter and 0.3 cm thick. Next are the three flare pellets separated by two brown felt discs the same as the previous one. The flare pellets are approximately 1.65 cms long and 2.8 cms in diameter. The top one is the heaviest, weighing 18.63 gms, the bottom one the lightest, weighing 18.50 gms, while the middle one weighs 18.58 gms. They appear to have a coating of fine black powder around the sides and base. The pellets consist of a compressed dark grey powder with following composition:-

Potassium nitrate	63%
Antimony trisulphide	12%
Charcoal	5%
Sulphur and Resinous Material	20%

One of these flare pellets, ignited while resting on a piece of galvanised iron burned for approximately 10 seconds.
Above the flare pellets is a thin white cardboard disc separated from the top plug by a pad of cotton waste.

(iii) Igniter and Propellant Systems: The base cover, cotton waste and striker block are removed, the fuse is bent so that it extends straight out from the radial groove in the base of the turned wooden block and through the prepared gap in the metal cylinder. The projector is then fixed in the desired position in the ground by means of the basal teeth. The friction striker is used to ignite the match head which in turn ignites the safety fuse finally exploding the charge in the projector. The projectile is thus expelled and its delay fuse is ignited while in flight, the charge within the projectile is exploded, thus expelling and igniting the three flare pellets. The function of the two paper rolls within the projectile is apparently to prevent the flare pellets and their associated discs from lying on top of the channel in the top of the wooden block. A passage is thus kept clear through the channel and up between the rolls for the flash from the explosion of the charge to ignite the pellets laterally. Details of fuses and charges are as follows:-

Length of safety fuse (exluding match head)	approx ..	7.5 cms
Time elapsing from striking of match head to ignition of charge in projector ..	approx ..	12 secs
Weight of granular black powder charge expelling projectile		5.08 gms
Length of delay fuse in .. .. .. projectile		2.4 cms
Burning time of delay fuse in projectile	approx ..	2 secs
Weight of granular black powder charge expelling flare pellets ..		0.67 gm

(iv) Markings: Characters on large white paper label on metal cylinder are translated by Technical Officer

(CW) 2 Aust Corps as follows:-
"Trailing Star. Three white stars.
Type 93 4 cm Manoeuvre Signal Flare
For short distance night use
Colour of flare: White
Altitude 80 metres
Visible in daytime 1500 metres away
Visible in night time 5000 metres away
Effective for two years. Made in 1937"

(b) Green Parachute Flare: The main components consist of (i) projector, (ii) projectile, (iii) parachute and flare and (iv) igniter and propellant systems. The weights and dimensions are as follows:-

Total weight (as received)	247 gms
Weight of Projectile (not quite complete)	85 gms
Weight of Flare	36 gms
Weight of Parachute and cords	5 gms
Length Overall	18.3 cms
Length of Projectile	9.3 cms
Diameter Overall	4.4 cms
Diameter of Projectile	4.1 cms

(i) Projector: The metal cylinder is identical with that in the previous flare and bears a similar sized label. The lacquer coating has practically worn off, giving it a more silvery appearance compared with the other flare. The method of closing the top of the projector appears to have been the same although only the cardboard disc and the entire portion of the brown paper band remains. This is held on by means of a slip-on lid approximately 2.0 cms long while at the base is a similar sized slip-on cover. Whether any or both of these originally belonged is obscure. They are both shorter than the base cover in the previous flare. Within the upper portion of the cylinder is a spacer made from a 2.6 cms wide piece of brown cardboard folded to be Y shaped in section. Below it is a thin brown cardboard disc, beneath which is the top of the flare.
Inside the base of the projector, the striker block is missing, although the arrangement of the fuse and construction and attachment of the turned wooden block are as in the previous flare. Above the wooden block are the cardboard and felt discs, the only difference being that in this case the former is brown and the latter white.

(ii) Projectile: Layers of thin brown cardboard in this projectile form the tubular body. The top had been opened and only the thick brown cardboard disc remained. The wooden block and delay fuse are the same as in the previous flare, except for the absence of the channel at the top of the block. The charge is also missing.
As the flare received had already been opened the internal arrangement within the projectile was taken largely from a report dated 30 Mar 44 and prepared by Tech Offr (CW), 2 Aust Corps. The cardboard disc with no central hole shown above the charge appears to be incorrectly placed. It is doubtful whether the

flare would be ignited by the explosion of the charge with any certainty. As the sample was received, the card was placed between the parachute and the cotton waste pad. This seems to be a more reasonable place for it, but since the raffia binding around the flare is mixed in with the parachute cords and the charge is missing, little significance can be attached to the position the disc then occupied. Perhaps an additional cardboard disc with a central hole, normally present above the charge, is missing. The felt pad below the flare is white. The cotton waste pad above the parachute consists of pieces of cotton seed coat with short fibres attached to them. This feature may further warrant a cardboard disc being present above the parachute.

(iii) Parachute and Flare: The parachute has been cut from a sheet of green dyed tissue paper, is octagonal in outline, and has a side of approximately 17 cms. The distance between any two parallel sides is approximately 42 cms. The parachute cords are tied to the centres of strips of the same green tissue paper approximately 6.6 cms long and 1.6 cms wide, which are in turn firmly glued to the upper surface of the parachute at the corners in a V-shaped fashion.
The eight silk parachute cords, approximately 0.50 cms in diameter, have a pinkish tinge and are 60 cms long to their attachment at the lower end to a white cotton cord. The cotton cord is approximately 40 cms long to the top of the flare and 0.125 cm in diameter. Around the lower 13 cms of this cotton cord is twisted a piece of asbestos cord approximately 0.25 cm in diameter. The two junctions between the three types of cord are covered by white tissue paper. Immediately above the flare the cotton and asbestos cords are knotted. Passing through the knot are two 8.3 cms long pieces of cord, one of asbestos, the other of cotton. The former is glued down the sides of the flare, while the latter is partly split into its three strands. These spread out and are also glued down the sides of the flare, the central strand at each end lying beside the asbestos cord.
As the parachute had been disturbed no observations can be made on method of folding. However, in the report previously mentioned it was stated to be in eight folds.
The flare is approximately 3.5 cms long and 3.1 cms in diameter. Glued to the top of the flare pellet is a thick brown cardboard disc. A piece of brown paper with fringed top is wrapped around the flare pellet in the form of a tube and the fringe had been folded in on top of the cardboard disc and glued down. The fringe had been made by removal of triangular pieces instead of simple cuts. On the top is a circular piece of brown paper. The base of the flare pellet is uncovered. The flare pellet is blackish in colour and appeared to have a layer of black powder over the base. Analysis showed the composition of the pellet to be:-

Barium chlorate	81%
Charcoal	11%
Resinous material	8%

(iv) Igniter and Propellant Systems: These systems are practically the same as those in the previous flare, except that the flare pellet is ignited at the base instead of laterally. The match head failed to ignite the safety fuse and in consequence no burning time can be given.
The black powder charge expelling the projectile weighs only 4.74 gms, while as previously mentioned the charge in the projectile is missing. The delay fuse on the projectile again burnt for approximately 2 secs.

(v) Markings: Translation of characters on label is taken from report by Tech Offr (CW), 2 Aust Corps is as follows:-

"Green Comet.
For long distance night use
Colour of flare: Green with green parachute
Altitude: 80 metres
Visible in daytime 3000 metres away
Visible in nighttime 8000 metres away
Effective for two years - Made in 1939"

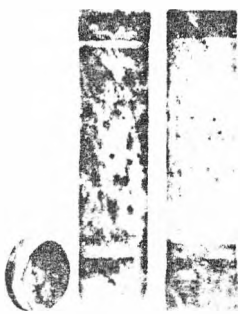
3. COMMENTS

The presence of charcoal in both of these flare compositions appears to be the main fundamental difference from those in the 50 mm signal flares described in AMF Tech Int Sum No.12.

(SOURCE:- 2/1 AUST CW LABORATORY, RAE)

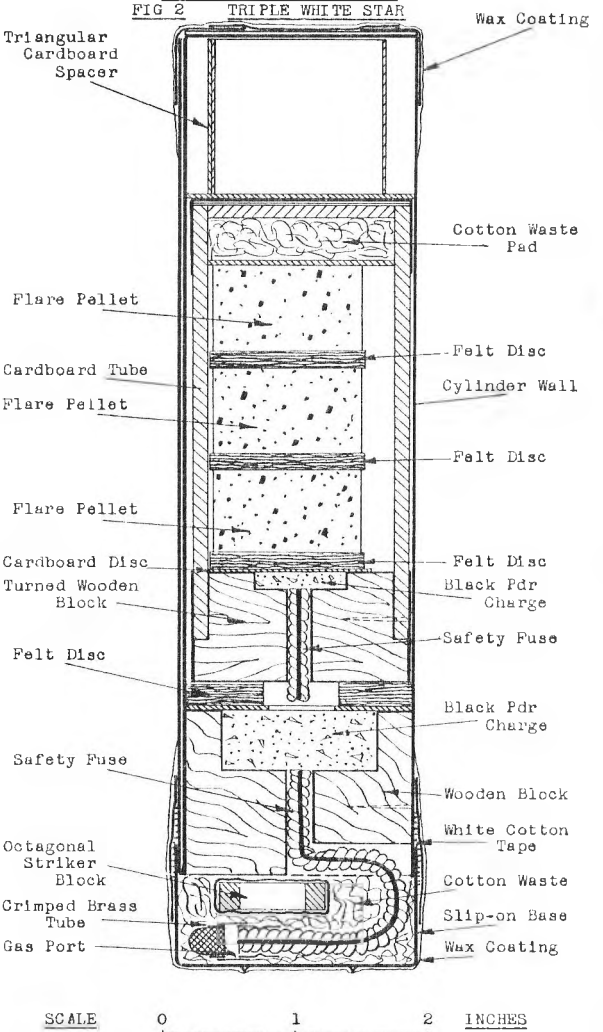
TYPE 93 4 CM SELF PROJECTING
SIGNAL FLARE

FIG 1



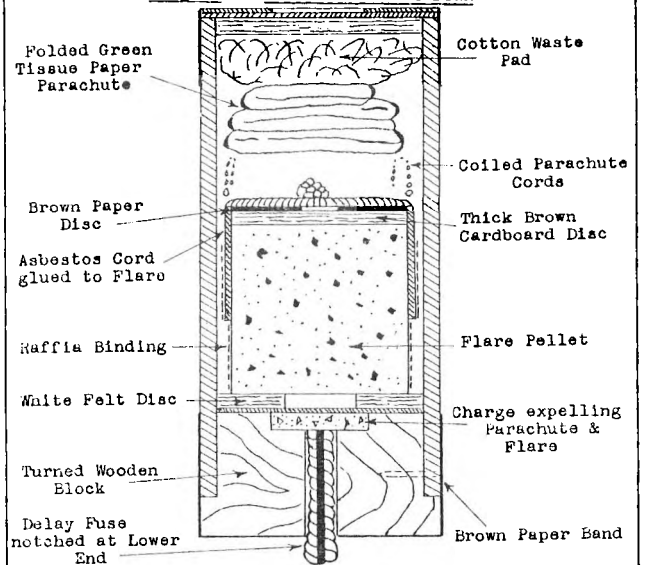
TYPE 93 4 CM SELF PROJECTING SIGNAL FLARE

FIG 2 TRIPLE WHITE STAR

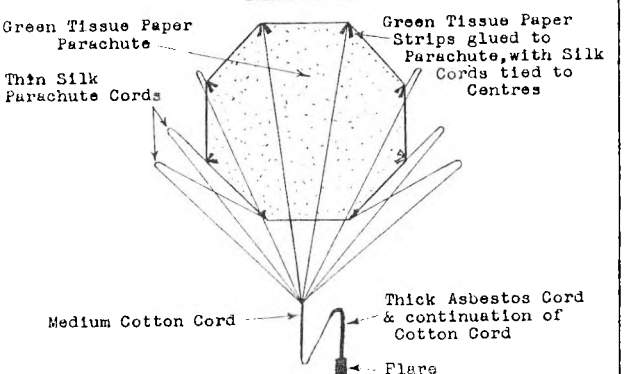


TYPE 93 4 CM SELF PROJECTING SIGNAL FLARE

Fig 3. GREEN PARACHUTE STAR



PROJECTILE



FLARE & PARACHUTE

GREASE

The grease examined was of a light lime-base type probably manufactured by a cold sett process from a low viscosity mineral oil, fat, calcium carbonate and possibly distillate fuel.

Small white particles visible consisted of unreacted calcium carbonate which would normally be expected in grease made by the above process. The strong odour is presumably due to the addition of a scenting material.

The grease should prove satisfactory for lubrication of parts where rough heavy automotive grease is used. Insufficient sample was available to carry out exhaustive tests and the following results should be taken as approximate.

Drop point °F (IP 31/42)	203
Composition	
Mineral Oil	75% (approx)
Soap content	21% (")
Free fat	1% (")
Viscosity - Mineral oil at 100°F, SSU	105 (")
Ash (Sulphated)	6.1% (essentially all calcium)
Free fatty acid (expressed as Oleic)	0.03%

(SOURCE:- MUNITION SUPPLY LABORATORIES through MGO Branch)

DETONATING FUSE

1. DESCRIPTION (Figs 1-2)

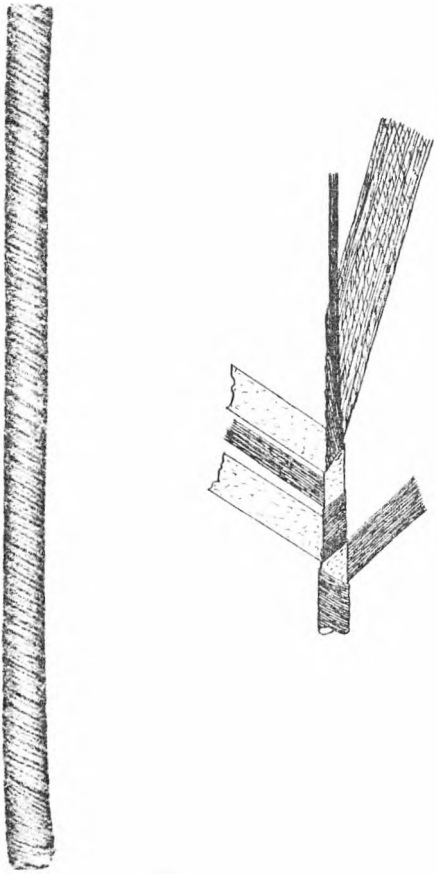
The fuse is light tan in colour and is approximately 6.75 mm in diameter. It consists of a core of three single threads of three-ply cotton around which is packed the HE train of pentaerithritol tetranitrate. This is then covered by five separate layers in the following order - five-ply threads, fine long fibred tissue paper, two-ply flax threads, thin light tan paper and three-ply cotton.
Firstly, thirteen five-ply threads of three-ply cotton are wound in an S spiral, down from left to right. The next layer is of fine long fibred tissue paper in strips 9 mm wide wound in a Z spiral, down from right to left with a 4 mm overlap. This paper is bound with nine two-ply flax threads also wound in a Z spiral and impregnated with a shellac-like waterproofing material which had been applied either in the molten state or as a thick varnish. The tissue paper prevents the waterproofing material from penetrating the interior of the fuse. The next covering is a thin light tan paper of the same dimensions as and wound similarly to the tissue paper inner layer. The external covering consists of twelve threads of three-ply light tan cotton wound in an S spiral.

(SOURCE:- MUNITIONS SUPPLY LABORATORIES through MGO Branch)

FIG 1 CROSS SECTION

DETONATING FUSE

FIG 2 External View and Construction.
(Approx. Actual Size.)



BODY ARMOUR

1. GENERAL

Two types of body armour have been recovered and are known as Naval Type II and Aerial Type III Model 1938. These types of body protection differ from the body armour already described in AMF Tech Int Sum Nos 4 & 8.

2. DESCRIPTION (Figs 1-4)

(a) Naval Type II

(i) This type provides protective armour for the front of the body and is composed of four plates attached by hinges to a centre plate. The plate thicknesses are as follows:- topplate .097 ins, centre .095 ins, bottom .098 ins, left hand side .094 ins and right hand side .095 ins. Results of hardness tests are set out hereunder:-

Plate	Brinell Hardness	
	Front	Back
Top	248 - 255	255 - 262
Centre	255 - 269	255 - 269
Bottom	255 - 262	248 - 262
Left	228 - 223	228 - 228
Right	228 - 235	241 - 235

The areas of the plates when disassembled are:- top-plate 55.0 sq ins, centre plate 93.0 sq ins, bottom plate 47.0 sq ins, side plates (two) 55.5 sq ins (total). The total of the individual areas is 250.5 sq ins. With the unit assembled there was an overlapping portion of approximately 1/4 in. wide.

(ii) Ballistic Limits: The ballistic limits of the breast plate section of this type of body armour are as follows:-

Cal .45 Ball	Cal .30 Carbine Ball	Cal .30 Ball M2
1123 f/s	1406 f/s	1158 f/s

(b) Aerial Type III Model 38: This type of body armour consists of a body and groin plate, helmet and leg protectors. The groin plate is attached to the body plate by hooks and eyelets. The plate thicknesses are as follows:- body plate .235 in., groin plate .235 in., leg protector .065 in., helmet .085 in. The front of the helmet was reinforced with a second thickness of metal, giving a total thickness of this part of .175 in.

Results of hardness tests are as follows:-

Plate	Position	Brinell Hardness
Body	inside	430 - 444
"	outside	460 - 430
Groin	front	418 - 444
"	back	430 - 444
Helmet	outside	600 - 627
"	inside	578 - 600
Leg Protector	front	235 - 245
"	back	230 - 245

The areas for body plate and groin plate are 172 sq ins and 67 sq ins respectively. An overlapping portion of ½ in. is present.
Ballistic limits are as follows:-

Component	Cal .45 Ball	Cal .30 Carbine Ball	Cal .30 Ball M2	Cal .30 AP M2
Helmet - front	x 1206	2157	= 1996	897
" - back	x 1189	1759	= 1468	
Breastplate	x 1190	x 2201	2752	1002
Groin plate	x 1196	x 2205	2750	1031
Leg Protector	931	1083	= 1002	xx 538

x No ballistic limit obtained. Figures denote highest velocity obtained with resultant partial penetration.

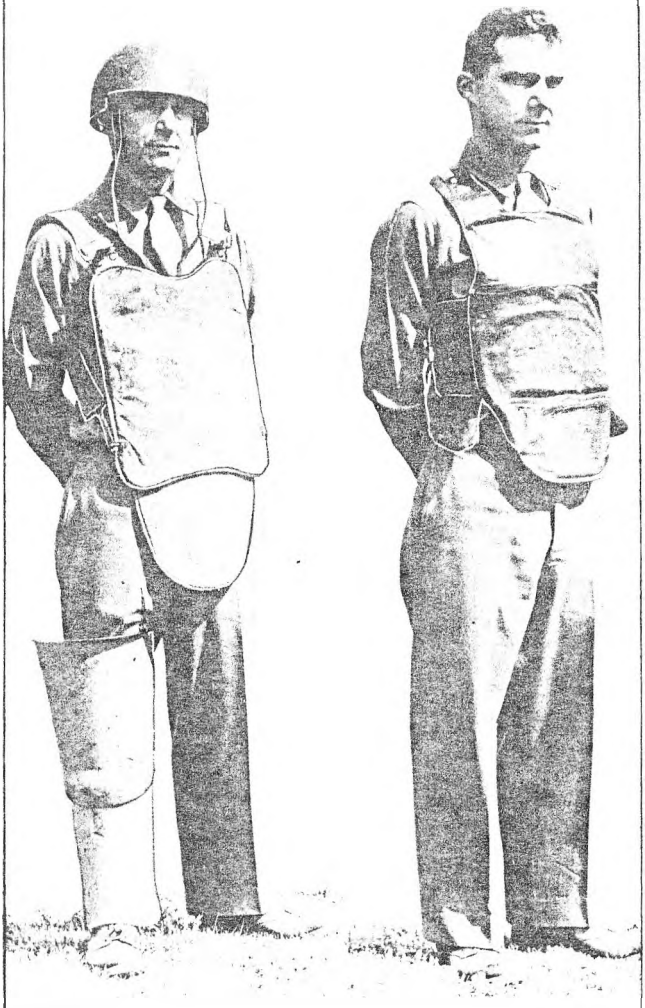
xx No ballistic limit obtained. Figures denote lowest velocity obtained with complete penetration.

= Approximate ballistic limit.

(SOURCE:- ABERDEEN PROVING GROUND MARYLAND)

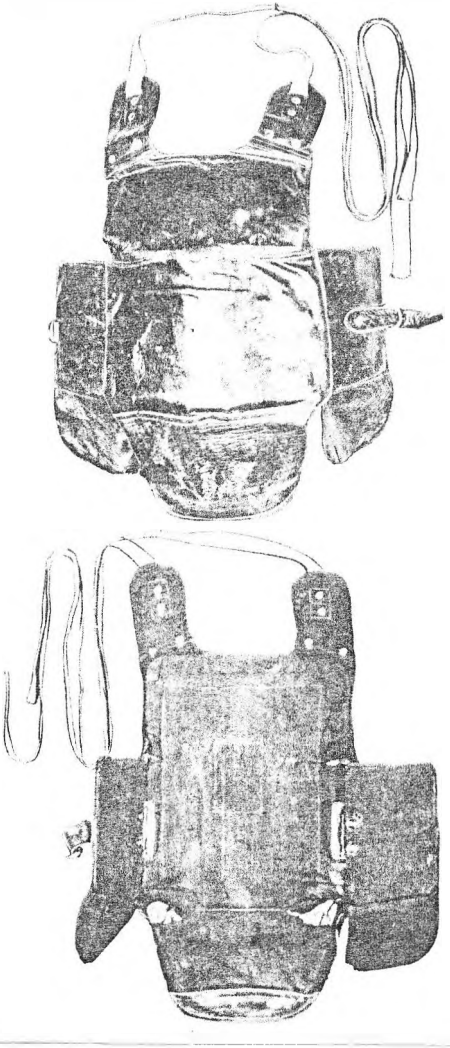
BODY ARMOUR

FIG I Left: Aerial Type III Model 38.
Right: Naval Type II



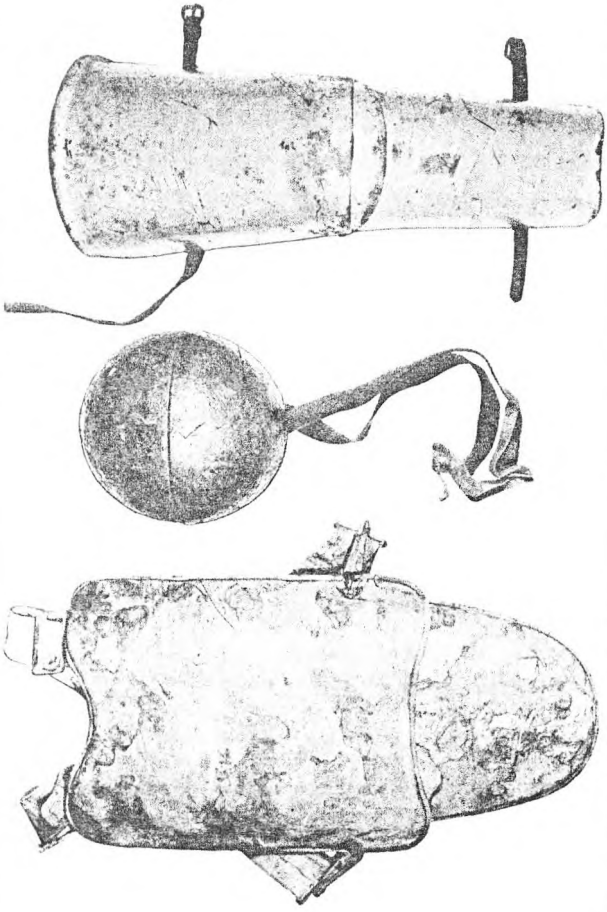
BODY ARMOUR

FIG 2 Naval Type II. Front & Rear Views.



BODY ARMOUR

FIG 3 Aerial Type III. Model 38. Front View.



BODY ARMOUR

FIG 4 Aerial Type III Model 38. Rear View.