



NORTH ATLANTIC MARINE MAMMAL COMMISSION



Handbook

For maintenance and use of weapons and equipment for
baleen whales in NAMMCO member countries

North Atlantic Marine Mammal Commission

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THANK YOU

The North Atlantic Marine Mammal Commission (NAMMCO) is proud to present this manual for the maintenance and use of baleen whale hunting weapons and equipment in NAMMCO member countries.

Special thanks are extended to Dr Egil Ole Øen who has generously shared his vast expertise in killing whales with harpoon grenades and rifles. Dr Øen has been instrumental in the preparation of the manual, and without his dedicated efforts this work would not be possible.

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Cover photo: SK Knudsen

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PREFACE

The North Atlantic Marine Mammal Commission, NAMMCO, works for coastal populations' right to capture and exploit marine mammals. This right also entails a duty for catchers and authorities to ensure that the catch is sustainable and that the killing takes into account the safety of catchers and animal welfare.

NAMMCO's fishing committee, established in 1994, will advise member countries on these issues. The advice must be based on the best scientific results and technological developments and prisoners' knowledge. Furthermore, it must take into account safety and efficiency in resource utilization. The committee has organized much of its work through workshops and expert group meetings within specific topics. A main recommendation from these meetings has been to strengthen captives' training in trapping methods and techniques.

When catching large whales, whale cannons and harpoons with explosive shells are used. As an auxiliary weapon coarse caliber rifle is used. Targeted work has been carried out for many years to improve hunting equipment, hunting techniques and training of shooters. Whaling is nevertheless still a business with a relatively high risk of injury to personnel, and in the last 15 years, serious incidents have occurred accidents due to dangerous shots with whale guns.

NAMMCO's Hunting Committee has prepared this handbook for the maintenance and use of weapons and equipment for catching baleen whales in NAMMCO's member countries. The target group is primarily whalers and shooters, but also includes inspectors, hunting officers and others involved in whaling. Whalers and arms manufacturers have been consulted in connection with this work, but the handbook is the catch committee's responsibility.

The handbook deals with hunting with whale guns in Greenland, Iceland and Norway, and is in three parts:

- 1) Information that everyone must know. This applies to necessary safety information regarding use of weapons, gunpowder and explosives.
- 2) Information that everyone should know. This applies to technical data, function and maintenance of Whale grenade-99, harpoon cannons, harpoons and rifles.
- 3) Information that is useful to know. This applies to an overview of control and maintenance of whale cannons, safety tests for public approval of Hvalgranat-99 as well as instructions for use and safety regulations.

Some information is repeated under several chapters.

Tromsø, February 2014 NAMMCO's Committee on Catching Methods:

Eypór Björnsson, Nette Levermann, Kristján Loftsson, Justines Olsen, Kathrine A. Ryeng, Hild Ynnesdal, Egil Ole Øen

IMPORTANT SAFETY INFORMATION

THE CANNON MUST ALWAYS BE TREATED AS IF IT IS LOADED

NEVER STAND IN FRONT OF A LOADED CANNON

THE CANNON BARREL MUST ALWAYS POINT TO THE SEA

THE BREECH END SHOULD NEVER BE USED TO Hammer A SHELL INTO THE BARREL IF IT IS TO TIGHT.

THE CANNONS, HARPOONS AND CASES MUST ALWAYS BE MAINTAINED

THE HARPOON MUST BE STRAIGHT AND FIT IN THE BARREL

HARPOONS WHICH MUST BE STRUCK INTO THE BARREL SHOULD NEVER BE USED

STRIKES CAN IGNITE THE POWDER BAG AND TRIGGER

THE SHOT FOLLOW THE INSTRUCTIONS FOR USE FOR THE GRENADE

THE GRENADE MUST BE HANDLED CAREFULLY BECAUSE IT CONTAINS EXPLOSIVES AND OTHER EXPLOSIVE ELEMENTS

THE GRENADE MUST BE SCREWED ONTO THE HARPOON WITH YOUR HANDS - NEVER USE TOOLS

GRENADES THAT CANNOT BE SCREWED ON BY HAND MUST NOT BE USED

NEVER SHOOT A GRENADE WITH A TRIGGER HOOK AND/OR TRIGGER CORD ARE LOOSE

NEVER PULL THE TRIGGER CORD IF ONE IS UNSURE WHETHER THE GRENADE IS DETONATED,

THE HARPOON MUST CUT OUT OF THE WHALE BODY

WHEN THE BOAT IS DOCKED, THE GRENADE MUST BE UNLOCKED FROM THE HARPOON AND THE SHELL CASE IS REMOVED FROM THE CANNON

NEVER PUT THE RIFLE AWAY WITH A CATRIDGE IN THE CHAMBER

EMPTY OR REMOVE THE MAGAZINE WHEN THE RIFLE IS NOT IN USE

PART I: WEAPONS AND EQUIPMENT: USE AND SAFETY INFORMATION

1. Load the cannon. Insert the harpoon and attach the line (precursor) to the harpoon.
2. Remove the grenade from the transport case (Fig 1). Remove the transport lid and take care of the screw.
3. Screw the grenade all the way onto the harpoon so that it is armed and ready to fire. Not use tools, but pull well with your hands. The trigger hook should now be approx. in the middle between the claws of the harpoon, and turn up (Fig. 27).
4. Check that the grenade is detonated (exploded) after the shot. If it is uncertain whether the grenade has detonated and the harpoon with the grenade is inside the whale, the harpoon must be cut loose and not pulled out of the whale.

HARPOON FAILURE If the grenade cannot be screwed all the way onto the harpoon with the hands, it is an error on the threads on the HARPOON. The grenade is not armed. **DO NOT** use such harpoons. What happen if the grenade is probably being detonated: - Bang from the detonation - Tremors in the animal - The whale blows out air and rolls onto its back - The whale sinks without moving.

For safety reasons, it is always important to follow the charging procedure.

Fig. 1. Whale grenade-99 in the transport case.



Photo: Nette Levermann
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WHALE CANNONS



Fig. 2. 50 mm Kongsberg whale cannon with harpoon and Hvalgranat-99 ready to fire. Photo: Björgvin Guðmundsson



Fig. 3. 90 mm Kongsberg whale cannon with harpoon and modified Hvalgranat-99 ready to fire. Photo: EO Øen Fig. 4.



60 mm Henriksen whale cannon with harpoon and Hvalgranat-99 ready to fire. Photo: SK Knudsen

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50 MM KONGSBERG WHALE CANNON (FIG. 2) Reference is made to Appendix I with a figure of a 50 mm Kongsberg whale cannon. Safety rules

- The cannon must only be used by trained personnel.
- The cannon must always be treated as if it were loaded.
- The end piece must never be used to drive in a shell that is tight in the barrel. If the shell must still be used, a wooden block is placed between the end piece and the sleeve as follows that it is clamped in place. The wooden block must not squeeze against the ignition cap. Such shells must be replaced or calibrated.
- Every time the cannon is loaded, it must be checked that the firing pin does not stick forward in front of the bottom of the breech block.
- A correctly firing pin protrudes 1.2 mm in front of the breech end in the moment of firing and then springs back into the breech.



Fig. 5. The buttplate in the breech of the 50 mm Kongsberg whale gun. The firing pin in the rear (secured) position. Photo: EO Øen

- Correct installation and length of the firing pin is checked by pushing the firing pin forward in front of the breech end and measure the length. On cannons that are converted to semi-safety, the trigger must be held during this test.
- When the firing pin is replaced and the new firing pin is adapted to the gun one have to ensure that the length is correct.

– If the firing pin cocks itself on firing, this is a signal that something is faulty with the mechanism,

the harpoon or the propellant charge. The error must be corrected immediately, as this entails a very high risk of accidental shots.

– The harpoon must never be inserted into the barrel before the cartridge has been inserted into the chamber and the ignition piston is in the rear (secured) position.

– The harpoon must be straight and fit in the barrel. Harpoons that must be smashed into the cannon barrel with impact devices must not be used. If the firing pin is in forward position, the shot can go off.

– When the cannon is loaded, the barrel must always point towards the sea.

– Never stand in front of a loaded cannon.

– When the harpoons are inserted into the barrel, someone must stand by if possible on the catch.

– Unscrew the grenade from the harpoon and remove the shell when the boat is docked. NB! The ignition piston can unscrew after use and should therefore be secured with it Loctite type 243 on the threads.

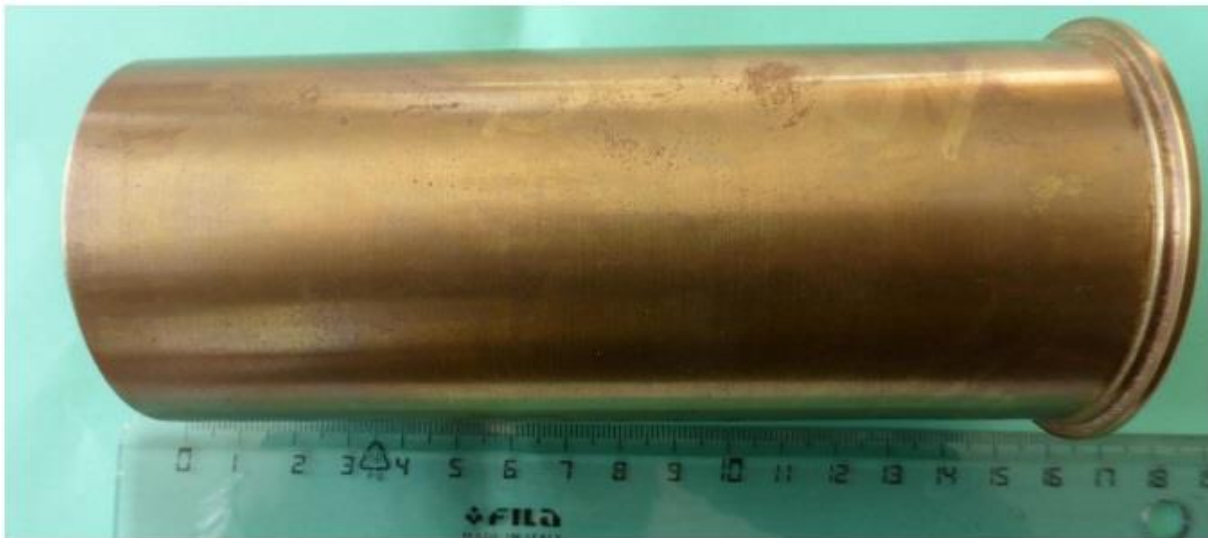
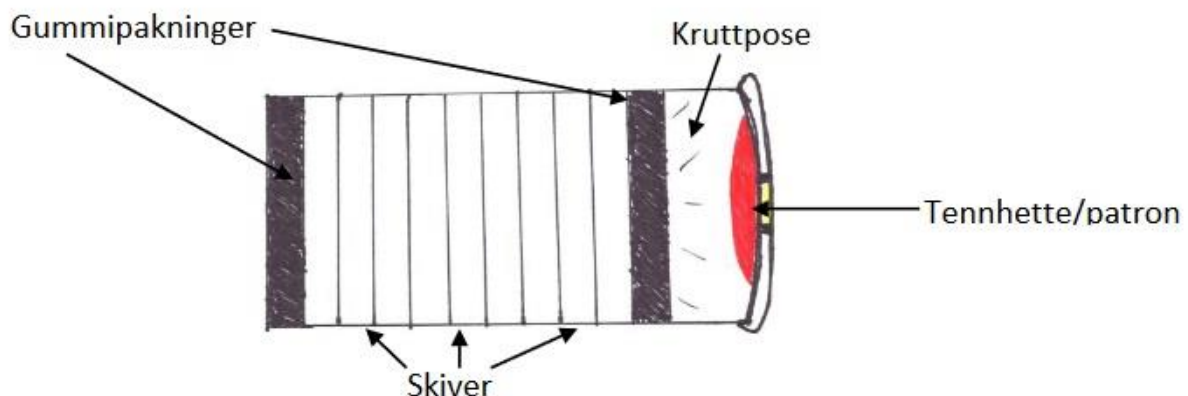


Fig. 6. Brass shell case for 50 mm Kongsberg whale cannon. Photo: EO Øen



Rubber gaskets, Gunpowder bag, Ignition cap/cartridge Discs

Fig. 7. Cut through, loaded shell.

Illustration: C Winsnes

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Fig. 8. Example of firing cap/firing cartridge (9 mm) for 50 mm Kongsberg whale cannon shell Photo: Nette Levermann



Fig. 9. Powder bag for Kongsberg whale guns. Photo: EO Øen



Fig. 10. Precharging with rubber seals. Photo: Nette Levermann

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Charging

1. Open the cannon's breech.
2. Check that the barrel is clean. Clean the barrel if necessary.
3. Check that the shell fits into the chamber (the shells expand during use and must regularly calibrated or changed).
4. Insert the powder bag into the shell, with the red part towards the firing cap opening.
5. Insert the precharge with the rubber seal against the powder bag and possibly one rubber gasket on top of the shell..
6. Place the ignition cap in place in the shell.
7. Insert the loaded case into the chamber. The breech end must never be used to drive in shell in.
8. Check that the firing pin is in the rear (safety) position before closing the breech (Fig. 5).
9. Insert the harpoon into the barrel and attach the line (precursor) to the harpoon or shackle.
10. Screw on the grenade.
11. Cock the cannon and put the safety on.
12. The cannon is now ready to fire.
13. After each shot, the barrel must be cleaned to remove powder residue and residues of powder bag and precharging. The loaded case should enter the chamber easily. If this is not possible do, the shell must be replaced or calibrated. If the shell must still be used, a wooden block is placed between the end piece and the sleeve, so that it can be push in place. The wooden block must not push against the ignition cap. If the shell does not fit in this way, it must NOT be used.

It is dangerous to force the sleeve into the chamber.

It is dangerous to drive harpoons into the cannon barrel with striking tools. If the firing pin is in the forward position, the shot can go off.

It is dangerous to shoot with a grenade that has a loose cord or is loose trigger hook. Loose parts can cause the grenade to explode in front of the cannon muzzle.

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90 MM KONGSBERG WHALE CANNON (FIG. 3) Safety rules

- The cannon must only be used by trained personnel.
- The cannon must always be treated as if it were loaded.
- The harpoon must never be inserted into the barrel before the cartridge has been inserted into the chamber and the firing pin is in the rear (secured) position.
- The harpoon must be straight and fit into the barrel. Harpoons that have been smashed into the cannon barrel with striking tools must not be used. The blows against the harpoon can ignite the powder bag so that the shot goes off.
- When the cannon is loaded, the barrel must always point towards the sea (Fig. 11).



Fig. 11. Fully loaded 90 mm Kongsberg whale cannon. Photo: EO Øen

- Never stand in front of a loaded cannon.
- Unscrew the grenade from the harpoon and take out the shell and harpoon when the boat is docked.

Charging

1. Open the barrel's breech (Fig. 12).
2. Check that the barrel is clean. Clean the barrel if necessary.

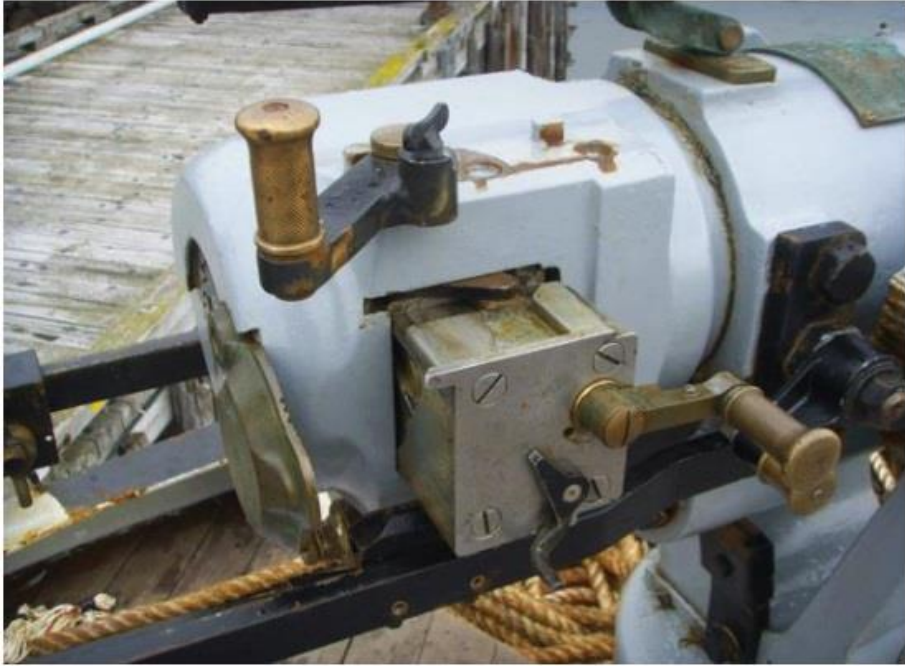


Fig. 12. 90 mm Kongsberg whale cannon with open breech. Photo: EO Øen 3. Check that the shell fits into the chamber (shells expand with use, and must regularly calibrated or replaced) (Fig. 13).



Fig. 13. Checking the sleeve. Photo: K Loftsson

4. Insert the powder bag into the shell with the red part towards the firing cap opening.
5. Insert the precharge with two rubber gaskets into the sleeve. The larger end on the rubber gasket with slanted walls must lie against the gunpowder bag.

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The other end must lie against the harpoon (Figs. 14 and 15).



Fig. 14 and 15. Precharging for 90 mm Kongsberg whale cannon. Photo: EO Øen

6. Insert the ignition cap into the sleeve.
7. Insert the loaded case into the chamber



(Fig. 16). Fig. 16. Charging. Photo: K Loftsson

8. Insert the harpoon with line into the barrel (Fig. 17).
9. Screw on the grenade and attach the trigger hook to the bend sling. Tight the trigger cord and tape it to the grenade and harpoon so that it does not loose loops occur on the string (Fig. 18).
10. Cock the cannon and put the safety on.
11. The cannon is now ready to fire.
12. The barrel must be cleaned to remove gunpowder residue and residues from gunpowder bags and preload.



Fig. 17. Harpoon is inserted into the barrel. Photo: K Loftsson



Fig. 18. 90 mm Kongsberg whale cannon with harpoon and modified Hvalgranat-99 for large whales. Trigger hook is attached to the bend sling on the harpoon. Photo: EO Øen

It is dangerous to shoot with a grenade that has a loose cord or a loose trigger hook. Loose parts can cause the grenade to explode in front the cannon race muzzle

60 MM HENRIKSEN WHALE CANNON (FIG. 4)

Safety rules – The cannon must only be used by trained personnel. – The cannon must always be treated as if it were loaded. – Check that the opening between the igniter cartridge and powder bag is not blocked by sight into the race from the front. – Place the rubber gasket on the precharge against the knot on the powder bag. – The harpoon must be straight and fit in the barrel. Harpoons must not be driven into the cannon barrel with impact equipment. The blows to the harpoon can ignite the powder bag so that the shot goes off. – When the cannon is loaded, the barrel must always point towards the sea. – Never stand in front of a loaded cannon. – Unscrew the grenade from the harpoon and remove the primer when the boat is docked. Charging 1. Before loading the cannon, the barrel must be thoroughly cleaned with suitable equipment (Fig. 19). Check that the barrel is completely free of remains of the preload and powder bag. Glowing residue in the barrel can ignite the powder bag when pushed into the barrel. Re-lubricate necessary the course with fat that does not contaminate the meat.



Fig. 19. Cleaning the barrel of a whale cannon. (From firing test). Photo: EO Øen

2. Check that the hole in the breechplug is open. This is best done by moving igniter mechanism aside on the HHMV igniter mechanism (Fig. 23) and look through the barrel. On cannon with a stock for the Remington mechanism (Fig. 24) the ignition cartridge must be removed.

3. Place the precharge on the powder bag. The "hollow" side of the rubber gasket on the precharge must be placed against the knot on the gunpowder bag (Figs. 20 and 21).



Figs. 20 and 21. Loading of 60 mm Henriksen whale cannon. (From trial firing of whale shells). Photo: EO Øen

4. The powder bag with precharge is pushed all the way into the barrel so that the red part of the powder bag faces the bottom of the barrel. Use a charging stick. The ignition mechanism must be open and without an ignition cartridge so that air escapes via the hole in the barrel base. This is important to ensure that there is no air pocket between base and powder bag (Fig. 22).



Fig. 22. Powder bag and precharge are pushed in to bottom of the barrel with a charging stick. Photo: EO Øen

5. Insert the harpoon into the barrel and attach the line (precursor) to the harpoon.

6. Screw on the grenade.

7. Open the action and insert the ignition cartridge (Remington mechanism, Fig. 24).

8. Insert the ignition cartridge and close the ignition mechanism (HHMV mechanism).

9. Remove fuse (HHMV mechanism, Fig 23).

10. The cannon is now ready to fire.



Fig. 23. HHMV ignition mechanism (blue color) Photo and illustration: EO Øen

Fig. 24. Remington firing mechanism

Grenades must always be stored and transported in a transport case.

ASSEMBLY

1. Unscrew the transport lid. Take care of the lid and screw so that the grenade about can be secured again if necessary for transport(Fig. 25).
2. Screw the grenade all the way onto the harpoon. NB! The left gang.
3. Pull well with your hands. Tools must not be used as they can cause damage on the grenade. When installed correctly, the trigger hook will stand approx. in the middle between the claws of the harpoon, upwards (Fig. 27). The grenade is now armed and ready to shot.
4. If the grenade cannot be screwed onto the harpoon by hand, the threads are faulty on the harpoon. The grenade will not be armed and will not detonate. **SUCH HARPOONS MUST NOT BE USED.**
5. An undamaged grenade is automatically secured when it is unscrewed from the harpoon. This can be checked by examining if the arming mechanism has gone all the way back (Figs. 26 and 37, and red box below).

How to check that the grenade is secured? (Figs. 26 and 37)

Unscrew the grenade from the harpoon. Then is the threaded hole and the reinforcing bar visible at the rear end. The outermost 10 mm of the reinforcing bar is painted red. On a secured (unarmoured) grenade, both the red and the uncoloured can be seen part of the rebar. On an unsecured (armored) grenade, only the red part is visible of the reinforcing bar. Grenades must always be stored and transported in a transport case.

An armored grenade will only detonated when the trigger cord is tightened in this way that the ignition mechanism in the grenade is triggered (50-70 kg pull).



Fig. 25. Hvalgranat-99 with transport lock/lid. Photo: Nette Levermann

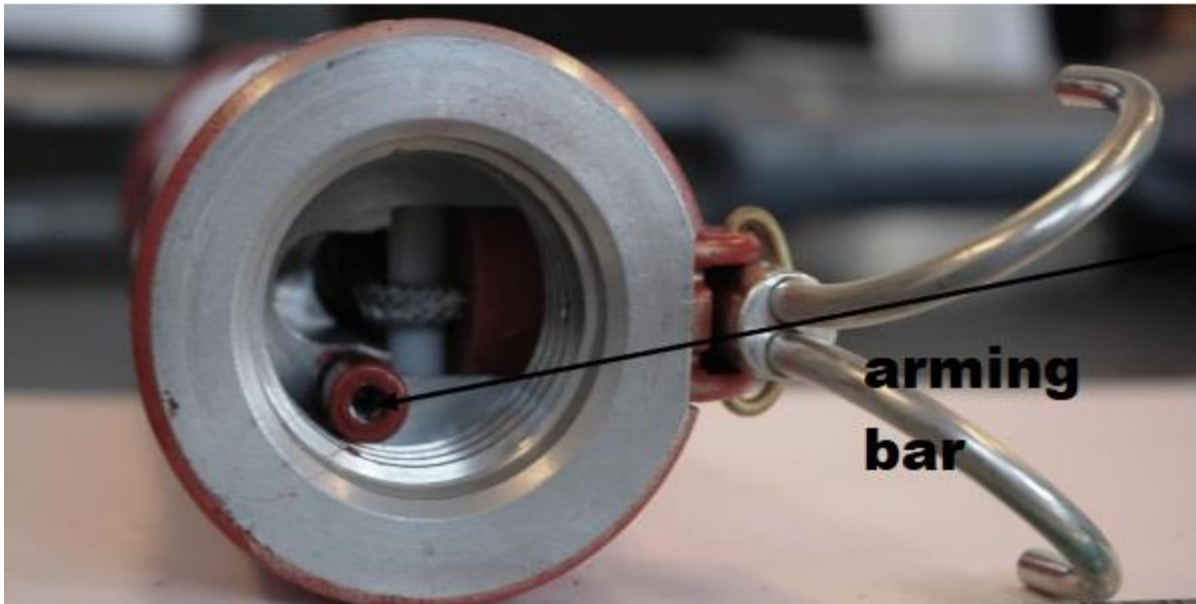


Fig. 26. Hvalgranat-99 seen from behind with arming bar in rear (secured) position. Photo: Nette Levermann

FIRING OF THE GRENADE

On impact, you can usually hear the grenade detonate and/or see reactions from the whale. See red box page 11. As a rule, the harpoon goes straight through a minke whale after the grenade is detonated. On a detonated grenade, the red aluminum sleeve on the grenade is torn off (Fig. 28) or the grenade is broken in two. Shells that have not detonated are treated as unexploded. See page 26. Rebar bar



Fig. 27. Whale grenade-99 with trigger hook. (From trial firing of whale shells). Photo: EO Øen



Fig. 28. Whale grenade-99 after detonation. Photo: EO Øen

If the harpoon has not gone through the whale and you are unsure whether the grenade is detonated, the harpoon must **ALWAYS BE CUT LOOSE**. It must **NOT PULL OUT** because the trigger hook can catch and detonate the grenade.

Miss/graze shot

In the event of a miss, the grenade does not detonate and it can usually be used again. If the grenade graze the whale, the trigger hook can be torn free without the grenade going off. When the harpoon has been taken on deck, the grenade is unscrewed from the harpoon in the usual way. Check that the grenade is secured. (See red box page 23 and Figs. 26 and 37). Is the trigger hook loose, it must be fixed on the hook holder with a new brass pin. The string is then placed in the plastic cup and secured with a couple of rounds of strong tape (Fig. 29) before placing the grenade on the harpoon. If the cord is worn off, the grenade cannot be used again and must be placed in the transport case with the transport lid on and is destroyed. If the harpoon has not gone through the whale and you are unsure whether the grenade is detonated, the harpoon must **ALWAYS BE CUT LOOSE**. It must **NOT PULL OUT** because the trigger hook can catch and detonate the grenade.

When reusing the grenade after a miss, the trigger hook and trigger cord must be properly attached to the grenade before the next shot (Fig. 29).



Fig. 29.

Hvalgranat-99 where the loose trigger cord has been put back in the plastic cup and taped.
Photo: EO Øen

Grenade that has been in salt water should be rinsed in fresh water before being inserted the transport box.

UNEXPLODED means is a shell that has entered or passed through the whale, without detonate. As long as such grenades are on the harpoon, they are armed (unsecured) and must be processed in the following way:

1. Unscrew the grenade from the harpoon.
2. Check if the reinforcing bar returns to the secured position (Figs. 26 and 37 and red box page 23).
3. If the arming rod goes back, the grenade is secured. If the trigger cord is intact the grenade be used again. If the trigger cord is missing, the grenade cannot be used and must be destroyed.
4. If the reinforcing bar does not return to the secured position by itself, one can try to pull it back with screw in the transport lid. Then with the transport lid on the grenade is stored in the transport case until it is destroyed (Fig. 1).
5. If you do not succeed in securing the grenade and the trigger cord is in place, cut it of near the opening. Remove the trigger hook before inserting the grenade in the transport case for destruction. **DO NOT PULL THE CORD.** Aluminum that has been in salt water should be rinsed in fresh water before being inserted the transport box. If there is an undetonated grenade inside the whale, the grenade must be cut loose and not pulled out of the whale.

Cut the trigger cord and remove the hook on grenades that are inserted in the transport case for destruction.

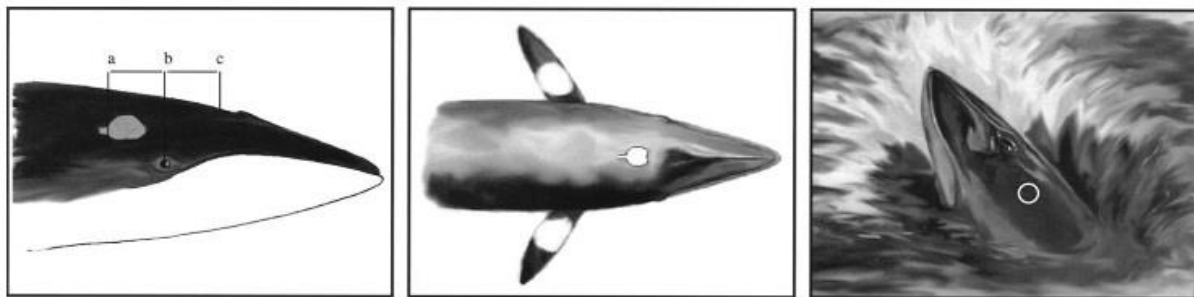
AUXILIARY WEAPON (BACK-UP)

It is common to have a method for follow-up (back-up) if the whale does not die immediately at the first catch attempt or if one is unsure of the effect. For minke whale hunt it is preferably carried out with rifles instead of shooting with new grenades. For large whales, you reload the whale cannon and fire a new shell.

ANATOMY AND POINTS OF AIM FOR GUN SHOTS

Rifles as auxiliary weapons and used for minke whales. The gunshot is aimed at the brain on the animal. The location of the brain in minke whales in relation to external characteristics such as the eye and blow holes are shown in Fig. 30. The pictures were made by Norges veterinary college on the basis of measurements on minke whales. Caliber requirements for auxiliary weapons and ammunition differ in NAMMCOs member states. The Norwegian regulations can be found in Annex VI.

Seen from the side, the brain is located midway between the eye and the dorsal side/surface of the head.



Figur 1

Vågehvallhode med hjerne sett fra siden

Figur 2

Vågehval hode med hjerne sett ovenfra

Figur 3

Vågehvallhode med inntegnet siktepunkt for rifle sett skrått bakfra

Fig. 1. shows that when projected on a horizontal line, the posterior edge of the brain (a) lies equally far behind the eye (b) as the blowing hook (c) lies in front of the eye.

The brain of minke whales is about 20 cm wide, 20 cm long and 15 cm high. The center of the brain is approx 55 cm behind the opening of the blow hole on a small minke whale and approx. 75 cm behind the opening of the blow hole on a large minke whale.

Fig. 30. Location of the brain in minke whales and aiming point for rifle shots from different positions. (SK Knudsen, H Rud and EO Øen)

Safety rules

- The rifle must always be treated as if it were loaded.
- Never put the rifle away with a shot in the chamber.
- Empty or remove the magazine when the rifle is not to be used immediately.
- Clean the weapon frequently to avoid rust and malfunction.

- When loading and using, the gun barrel must always point towards the sea and not onto the deck.
- The cartridge should go easily into the cartridge chamber. Must it be "pressed" in with the breech, it may be due to dirt in the chamber/rifle barrel or faults on ammunition. This can cause the barrel to explode when the shot is fired.
- Weak recoil may mean that the bullet has not exited the barrel. The barrel must be checked to be empty before the next shot is fired.
- If the shot does not go off (click), it is usually due to insufficient maintenance or grease/powder residue on the firing pin.
- If the shot goes off when charging, it may be because the firing piston protrudes from the breech block because grease/powder sludge prevents the firing pin from moving back in secured position.

Rifle bullets slow down quickly in water regardless of caliber and weight of the bullet. To ensure that the bullet penetrates the brain, one must shoot when the skull is above the water.

CANNON SHOT

Whale grenadet-99 is so designed it will detonate when it has penetrated 65-70 cm into a minke whale. Whale grenade -99 on large whales (fin whales, bowhead whales and humpbacks) will detonate at a depth of 110-120 cm in the whale. In the chest cavity are the heart and lungs with their large blood vessels. Above the chest cavity lies the spine with the spinal canal that goes up to the brain. These organs are vital and will therefore constitute the largest and most important target area on the animal. Detonation in this area kills the whale instantly or very quickly. The grenades are specially designed to detonate in the middle of the chest cavity if the shot is aimed at the chest and from the side. (Figs. 31 -34).

Aim the shot from the whale cannon at the chest region and as far away as possible.



Fig. 31 Vital vulnerability area (shaded) in case of detonation of a shell on minke whales (*Balaenoptera acutorostrata*). Illustration: S Kessler and EO Øen



Fig. 32. Vital vulnerability area (shaded) by detonation of a grenade on a fin whale (*Balaenoptera physalus*). Illustration: S Kessler and EO Øen

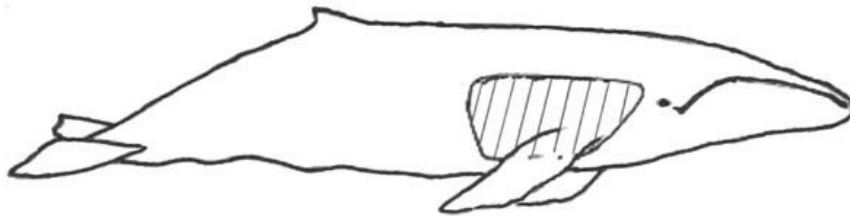


Fig. 33. Vital vulnerability area (shaded) by detonation of a grenade on a humpback whale (*Megaptera New England*). Illustration: S Kessler and EO Øen

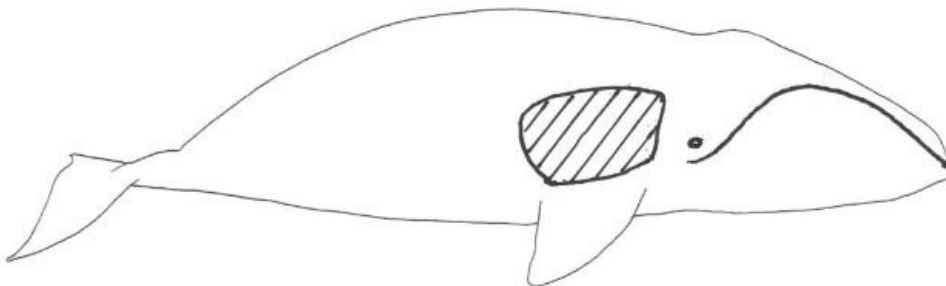


Fig. 34. Vital vulnerability area (shaded) in case of detonation of a grenade on a bowhead whale (*Balaena mysticetus*). Illustration: S Kessler and EO Øen

PART II: TECHNICAL STRUCTURE, FUNCTION AND MAINTENANCE WHALE CANNONS

There are three types of whale guns in use in NAMMCO's member countries (see page 12). They have different caliber (internal diameter in the barrel) and are named respectively as 50 mm Kongsberg, 60 mm Henriksen and 90 mm Kongsberg. Both Kongsberg cannons are breech loaders while the Henriksen cannon is a muzzle loader. The 50 mm Kongsberg is used preferably for minke whale hunting (Greenland, Iceland, Norway), but has also been shown usable for catching fin whales, humpbacks and bowhead whales in Greenland. The 60 mm Henriksen is used for pilot whale hunting in Norway, while the 90 mm Kongsberg is used for fin whale hunting in Iceland.

A two-component powder bag is used for all the guns. In the breech-loading guns (50 mm and 90 mm) the gunpowder bag is in a shell (cartridge) which is inserted into the barrel with a breech end that locks it firmly. A firing pin in the breech end ignites the powder bag the sleeve. The powder bag with precharging is loaded into the barrel of the muzzle loader cannon (60 mm) with a ramrod. The powder charge is ignited by an igniter cartridge. The first line is attached to the harpoon possibly with a shackle. The precursor lies coiled under the barrel and is usually connected to another line or wire one a winch.

The cannon stands on a foundation, made of wood, which is solidly attached to the deck and reinforced with strong struts to prevent the cannon from moving when fired. The barrel is fixed in a holder, "cradle/fork" on the gun carriage so that the barrel is movable. The cradle is equipped with side bearings that must be checked and replaced if needed, see also Appendix I. The cannon sights are traditionally open, but many have now replaced the sights or supplemented the open sights with modern, optical sights.

The cannon foundation must be solid and properly attached to the deck. If necessary, the foundation have to be reinforced.

POWDER BAG AND LOADING

The gunpowder bag consists of smokeless gunpowder. The amount of gunpowder varies for the different caliber. The powder bag is ignited by a smaller charge of black powder (red colour, see fig. 9). Between the gunpowder bag and the harpoon is a gasket, the so-called "precharge". It is placed with a rubber plate at the end against the powder bag. In addition, some use also a rubber gasket on top of the precharge to

prevent moisture penetrating the gunpowder. On the 90 mm cannon this is standard, see figs 14 and 15. The purpose of the rubber seal over the gunpowder bag is to prevent leakage of the pressure when the shot goes off. If the pressure is reduced due to leakage, the speed is reduced and so the accuracy of the harpoon. The "hollow" side of the rubber seal must lie against the powder bag.

SHOT

When the shot goes off, a strong pressure occurs inside the cannon which gives the harpoon a speed of 90 -100 m/s when it leaves the barrel. This driving force creates a counter force, recoil, which is captured partly by a built-in "recoil brake" in the cannon and partly by the mount and stays on the boat deck. Faults in the recoil brake, lack of fluid, struts or weaknesses in the carriage can cause the barrel to move uncontrollably and this leads to a miss with the harpoon. Good maintenance of the cannon with bearings and struts will be crucial for function and accuracy.

SAFETY AND MAINTENANCE OF GUNS

Below are some simple rules for cannon and harpoon maintenance as well as some general safety rules. Control and maintenance form can be found in annexes II and III.

Shooting Accidents

Shooting accidents happen when shots go off unintentionally. With the 50 mm Kongsberg it has happened when harpoon was inserted into the barrel. It has been proven that some accidents happen because the firing pin was not in the secured position. Then it can ignite the ignition cap/ignition cartridge in the shell without pulling the trigger. That's why it should always check that the firing pin is in the rear and secured position during charging. The reason for the firing pin to protrude from the lock, among other things, can be bad cleaning of ignition firing pin or the striking spring, a loose or too long firing pin or a fault in the safety mechanism (self-charging). On 60 mm cannons, shooting accidents have occurred when loading the cannon. The reason have probably been burning remnants of precharge and paper in the barrel that have ignited the powder bag during charging. Therefore, barrel cleaning is important before charging. If the harpoon so badly adapted that it has to be beaten in with a hammer this can the powder bag ignite. Harpoons that are too narrow in the barrel must not be used.

GENERAL MAINTENANCE OF WHALE CANNONS

- Cannon, harpoons and all other fishing equipment must be maintained optimal at all times.

- washers with hot water can be used to clean the cannon in combination with detergent to remove gunpowder sludge, salts, acids and the like. A rotating brush can be used to clean the barrel mounted on a drill.
- After cleaning, all parts must be fitted with anti-rust weapon spray or oil.
- Before the cannon is used for hunting, moving parts in the mechanism must be dry-polished to avoid malfunctions.
- For a lubrication of the harpoons when loading its recommended to use vegetable fats or cooking oils that do not contaminate the meat.

HARPOONS

The harpoon is used to fire the grenade into the whale and then to pull the whale into the catching vessel. They usually weigh 15-17 kg (50 mm), 17-19 kg (60 mm) and approx. 70 kg (90 mm) and it is pushed into the barrel from the front.

In order for the Hvalgranat-99 to function as intended, the pin must be threaded the harpoon must be exactly 27 mm long and perpendicular at the end (Fig. 37a). The grenade must screw all the way onto the harpoon (Fig. 37c) with your hands. There should not be implements or some kind of packing between harpoon and grenade. If its not possible to screw the grenade on with your hands such harpoons must not be used. When correctly installed, the trigger hook must be in the middle between the claws of a harpoon when the grenade is screwed on, and turn up (Fig. 27).

The condition and maintenance of the harpoon is of great importance for accuracy. The harpoon must be straight and fit in the barrel. Worn, crooked or ill-fitting harpoons work poorly. They have reduced range and accuracy. Rear end of the harpoon must fit exactly into the barrel and be placed completely against the precharge. An opening, air pocket, between precharge and harpoon gives reduced speed of the harpoon. The legs must be parallel so that the line runs freely. The precursor should be as close to the muzzle as possible to avoid too much bends on the precursor when it is pulled out. Bends destabilize the harpoon and reduces accuracy.

WHALE GRENADE-99

Hvalgranat-99 is used for the whaling cannons of all NAMMCO member countries. The grenade was originally developed for the capture of minke whales in Norway in 1997 - 99, but is later also modified and adapted to catching fin whales (Iceland) and fin whales, humpbacks and bowhead whale (Greenland).

Whale grenade-99 for use in minke whale hunting (50 mm Kongsberg and 60 mm Henriksen guns) are made of aluminum with a steel nose and weigh 1.75 kg (Fig. 35). In the thin aluminum tube the internal are sealed with a O-rings to protect the internal parts of the grenade (ignition mechanisms, explosives and safety mechanisms) against mechanical damage and moisture. The explosive charge consists of 30 g of pressed penthrite. The trigger cord (length 42-43 cm) is adapted to explode the grenade at a depth of 65-70 cm and a pull on the cord of approx. 50-70 kg. The blunt shape of the nose piece ensures that the harpoon/grenade does not skid when it hits the water and/or the whale, but continues straight ahead.

For the large whale hunt in Iceland, a modified Hvalgranat-99 with 90 mm diameter is used in the Kongsberg guns (Fig. 18). It is built around a core of steel and an external aluminum sleeve. The explosive charge consists of 100 g of pressed penthrite, and the trigger cord (length 90 cm) is adapted to a blasting depth of 110-120 cm.

For the large whale hunt in Greenland, a modified Hvalgranat-99, 50 mm caliber, is used in Kongsberg cannons. This is identical to the original Hvalgranat-99 except from the explosive charge, the trigger cord, and the yellow color marking of the nosepiece. The explosive charge consists of 45 g of pressed pentrite and the trigger cord (length 90 cm) is adapted to a blasting depth of 110 - 120 cm.

TRANSPORT INSURANCE At the rear end of the grenade there is a transport lock (Fig. 25). This is a aluminum lid which is screwed to the reinforcing bar and which ensures that the grenade cannot be reinforced during handling and transport. The transport lid must always be fitted on when the grenade is removed from the harpoon. The transport lid is fixed with a screw, and then as long as the transport lid is on, the reinforcing bar is locked in a secured position.

FIRING MECHANISMS The arming mechanism is reversible. This means that the grenade is armed when it is screwed onto the harpoon, and automatically goes back (reversed) in the secured position when the grenade is unscrewed from the harpoon. This is checked by checking the reinforcing bar which is visible at the rear end of the grenade. When the reinforcing bar is in the secured position, it is pushed all the way back so that both a red and an unpainted part of the rod

is visible (Figs. 26 and 37b). If only the red part of the bar is visible, it is the grenade armored (Fig. 37c).

Even if the grenade is armed, it cannot go off without the firing pin (Fig 36) buckled and pulled off.

The trigger mechanism has a cocking trigger and consists of a double hook (trigger hook), which is attached with a brass pin to a hook holder (Figs. 35 and 36). A strong cord (trigger cord) runs from the trigger hook to the firing pin (Fig. 36) inside the grenade. The firing pin is built with tension extraction which involves that the firing pin cannot fire the grenade until it is cocked with a spring. This the spring is only tensioned when the trigger cord is fully pulled out and the pull on the cord remains increased to between 50-70 kg. But the cocking mechanism is also reversible. If not when the pull on the cord reaches 50 kg or more, the ignition piston automatically retracts secured position when the tension in the trigger cord is released.

The trigger cord is coiled up in a plastic cup filled with wax (Fig. 35) which should prevent the string from getting stuck under the shot. A loose hook and/or string can result that the grenade goes off in the air. The length of the trigger cord determines how far in in the whale the grenade goes before it detonates.

The grenade must be screwed all the way onto the harpoon threads. With the correct length of the threads (27 mm), the trigger hook will be left in the middle between the claws of the harpoon. The harpoon must be turned so that the trigger claws point upwards to ensure that they do not get caught in the line when the shot is fired.

SHOT

Regardless of the result of the shot (hit in the whale, graze shot, miss), it must always be checked whether the grenade has detonated when the harpoon or the whale is hauled in. Is the whole or parts of the red aluminum sleeve missing, the grenade has gone off. Is the red one the casing, intact, the grenade is not exploded. If the harpoon is inside the whale so that the grenade is not visible, and one is unsure whether the grenade has gone off, shall the harpoon is always cut out and not pulled out with the winch. Shells that have not been detonated must be unscrewed from the harpoon immediately. It must check whether the reinforcing bar has returned to its secured position. Is not rebar in secured position, you can try to pull it back with the screw the transport security. If this is not successful, the grenade must be inserted the transport box with the transport security on and later destroyed. Sitting trigger hook in the cord, the cord must be cut in front of the hook.

In graze shots, the aluminum casing of the grenade can be damaged (dented) and the trigger hooks disengage without detonating the grenade. If the trigger hook is loose, it is fixed with a new brass pin and the trigger cord is placed in the plastic cup and fixed with strong tape. If the sleeve has been dented, it may happen that the rebar does not retract by itself. Then it can usually be pulled back and the grenade is secured with, for example, the screw for the transport lock. Going arming rod back in the secured position, the grenade will usually function normally and can be used again. Can the reinforcing bar not be pulled back into the secured position with the screw, the grenade should not be used, but put in the transport case with its transport protection on and destroyed.

In the case of a miss, the grenade can usually be used again. If the trigger hook has loosened, care must be taken that it does not hang up or tear loose when inhaling. If the pull in the grenade exceeds 50 -70 kg, the grenade will go off. After inhaling the harpoon it is placed on the deck and the grenade is screw off. It is checked that the arming rod goes into the secured position before the grenade is either reused or inserted the transport case with the transport lid on. If the trigger hook is torn loose, it should fasten with a new brass pin and the trigger cord is placed in the plastic cup and secured with a couple of rounds of strong tape around the grenade.

It is dangerous to fire a grenade that has a loose cord or is loose trigger hook. Loose parts can cause the grenade to detonate when the harpoon exits the barrel.

THE EXPLOSIVE CHARGE The explosive charge consists of the explosive pentrite (Pentaerythritol tetranitrate, (PETN)) pressed into rings. Pentrite is a so-called secondary explosive. Secondary explosives are more stable, have potentially greater explosive power per unit weight and are less sensitive to external influences than primary explosives such as black powder. Black powder is ignited by heat, friction, impact and electrical discharges, which is not the case to the same extent for pentrite. Pentrite is insoluble in water and is not toxic. The detonation occurs with hypersonic speed (6,500 - 8,400 m/s) at which pentrite is converted into natural gases and water ($\text{CO}_2 + \text{CO} + \text{O}_2 + \text{NO} + \text{N}_2 + \text{H}_2\text{O}$) which initially emits neither smell nor taste in the meat. Pentrite ignites and burns at approx. 150° C, but must at normal pressure exposed to very high temperatures, approx. 4250° C, before it detonates. Attempt with Hvalgranat-99 has shown that it does not detonate even if it is in the transport box in a fire for more than half an hour, see safety tests appendix IV. It is dangerous to fire a grenade that has a loose cord or is loose trigger hook. Loose parts can cause the grenade to detonate when the harpoon exits the barrel.

When pentrite detonates and passes into the gas phase, a strong increase in pressure occurs which expands lightning fast (hypersonic) and spreads like a bubble in the surroundings. A series of pressure waves of over and under pressure occur which can be fatal for living tissue and organs also far away from the detonation site. Vital organs such as nerves and brain tissue, heart and blood vessels can be damaged and unconsciousness and death can occur instantaneously. Investigations have shown that when Hvalgranat-99 is detonated centrally in the front half of the animal (chest, spine, neck/head) dies in almost 100% of minke whales instantly. Detonation in other areas of the animal gives a more uncertain effect. The shooter must therefore aim at the chest region and as much as possible from the side.

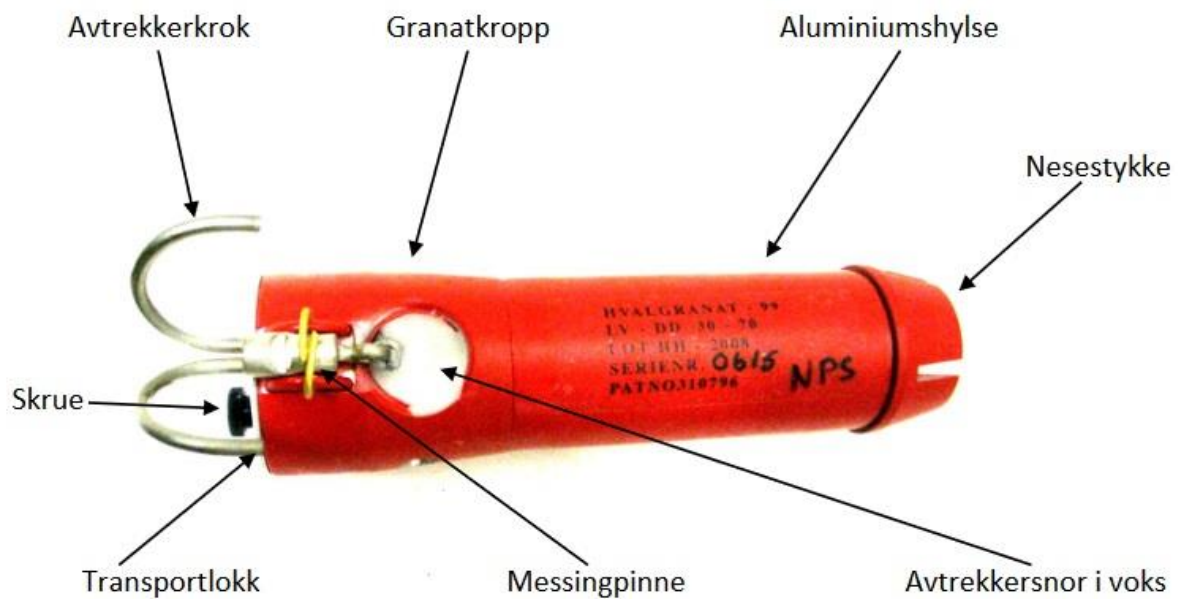


Fig. 35. Whale grenade-99. Photo: EO Øen

Hvalgranat-99 has the following information on the aluminum sleeve:

Example of text on Minke Whale Grenade:

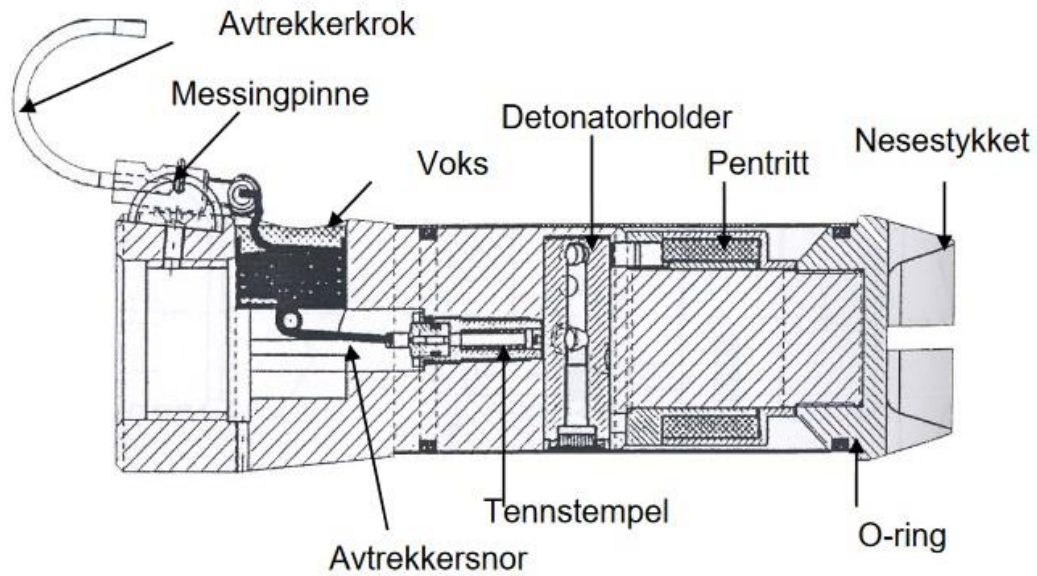
LV – DD 30 – 70:

LV (Load Weight) indicates the quantity of pentrite in grams

DD (Detonation depth) indicates the detonation depth inside the whale in cm LOT

HH - 2008 indicates the place of production and the year of production

SERIAL NO. is the grenade's identification number Trigger hook Grenade body Aluminum sleeve Nose piece Screw Transport lid Pull cord in wax Brass pin



Trigger hook
 Trigger cord / Wax
 Pentrite
 Ignition piston
 Detonator holder
 Brass pin
 The nosepiece O-ring

Fig. 36. Trigger system in Hvalgranat-99. Cut through.

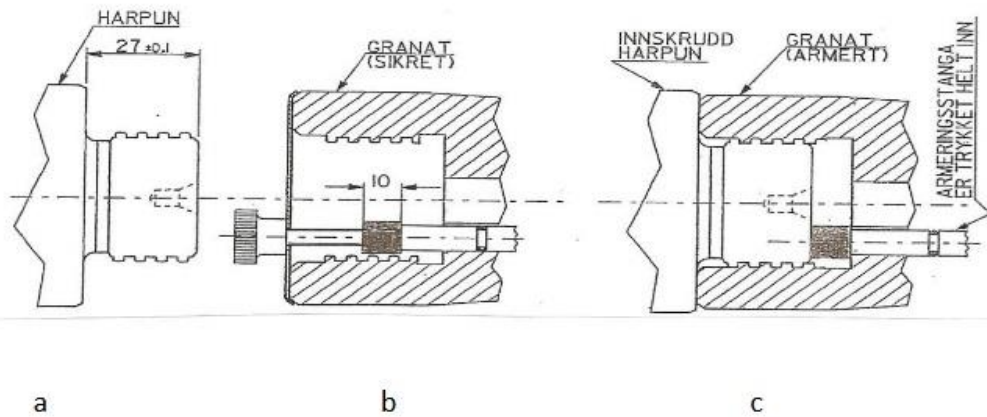


Fig. 37. The figures show the front part of the harpoon (a) and the back part of the grenade (b) and the grenade screw on harpoon (c).
 (a) Threaded harpoon socket.
 (b) Threaded part of Hvalgranat-99 with transport lock and arming rod in secured position. NB! Trigger hook not included.
 (c) Grenade correctly mounted on harpoon with arming rod in armed position. NB! Trigger hook not included.

GUN

It is common to have a method of follow-up (back-up) if the whale does not die immediately at the first euthanasia attempt, or if the practitioner is unsure of the effect. In the large whaling is the follow-up method to fire another shell. In minke whale hunting a big-caliber hunting rifle with ammunition that penetrates hard bones is used (cranium) as back-up. The shot is aimed at the brain or the front of the neck from relatively short distances (< 15m), and only when the whale has its head above the water (Fig. 27). In an emergency, if the head does not come above the water, the shot can be aimed at the heart.

CALIBER

The weapon designation "rifle" indicates a gun with a rifled barrel. The parts between the lands are called grooves. The caliber indicates the distance between the rifled grooves in millimeters or 100ths or 1000ths of an inch. In case of a full caliber designation it indicate also the length of the cartridge (case). A commonly used cartridge for hunting is the caliber 7.62 x 63. It is also called caliber .30-06. This means that the barrel diameter (the distance between the lands) is 7.62 mm or 0.30 inch, and that the case length is 63 mm. 06 stands for 1906 when this caliber was adopted in the USA. In the 1990s, systematic investigations into the effect were carried out in Norway with shots to the brain/neck of minke whales with different rifle bullets and calibres. The investigations resulted in the minimum permissible caliber for minke whales being set at 9.3 etc. However, the most common calibers today are somewhat larger, respectively .375 (9.525 mm) and .458 (11.633 mm). In Greenland, the smallest permitted caliber is .30-06 (7.62x63).

AMMUNITION

Full metal jacket have a relatively soft core surrounded by a mantle of hard metal (sheath) which is open at the rear end. The front part (ogival) can have different designs, from pointed to hemispherical. Fully jacketed projectiles are intended to penetrate deeply into the target. However, pointed balls tend to skid easily when hitting bones, while bullets with a round or blunt nose shape (ogival) penetrate more easily into and through bones without being deformed. In the case of shots against hard bones such as the skull or neck vertebrae of minke whales, the full jacket, round nose, must be used, this is mandatory in Norwegian minke whale hunting. In Greenland, the type of ammunition is not defined. Lead point or hollow point is common for hunting ammunition. These bullet types have a soft tip surrounded by a mantle which is open in front and closed behind. They are intended to burst and open like a mushroom (expand) when hitting the animal. They make a

large wound cavity as they pass through the tissue, but will often stop, disintegrate and/or skid when they hit hard bones. Lead tip bullets are therefore not recommended for the killing of whales larger than dolphins. All metal, these projectiles are made of metal alloys that expand (extends) in the same way as a lead tip and a hollow tip and they are not suitable for larger whales than dolphins.



Fig. 38. The figure shows different types of balls. From left: pointed, full-metal cal. 308, lead tip bullet. 30-06, round nose, full mantle cal. 9.3 and round nose, fully sheathed cal. .375. Photo: EO Øen

AIM

The rifle must have good sights. They are usually equipped with open sights. These are simple sights where the eye must focus on three points at the same time. This is difficult and many prefer more modern, optical sights (binocular sights, red dot sights) where such difficulties are eliminated. The magnification is usually adjustable and is stated on the binoculars. For back-up on whales, there is no advantage for high magnification as it makes it difficult to find the target area quickly. The shooter must therefore assess for himself what is appropriate. Telescopic sights must be firmly attached and placed as low as possible on the rifle. The fixing screws should be checked regularly. Electronic sights (point sights) show the point of aim as a red dot on the target. Such sights have become common in whaling, both on rifles and whale cannons. Different ammunition has different trajectory. The rifle must therefore always shot in with the ammunition that be used in the catch.

CARE AND MAINTENANCE OF THE RIFLE

When used at sea, the weapon will be exposed to moisture and salt water. It is very important that the weapon is cleaned and oiled to prevent rust. It can be necessary to polish the weapon (barrel, mechanism, exterior) every day. Gunpowder residue on the breech block and in the chamber is removed with a cleaning cloth. The parts are then protect with gun oil. After each season, polish the weapon thoroughly and oiled before putting it away. If there is a lot of dirt on the weapon, you can use soap and boiling hot water for cleaning where it is not possible to get cleaning supplies. Before the weapon is used again, it is important to dry polish the weapon otherwise it can malfunction. This is particularly important in cold environments. After a few seasons, one should bring the gun to a gunmaker to open the mechanisms and check the weapon.

CLICK AND FAILURE ,

i.e. the shot is not going off, occurs. The most common reasons are insufficient maintenance or failure of the weapon:

- Cracked or damaged firing pin
- Faulty spring for the firing pin
- Grease or dirt (gunpowder residue) which slows down the firing pin
- Gunpowder residue or grease in the cartridge chamber

DANGEROUS MALFUNCTION

The gun action is difficult to open

If the breech end is stuck or is difficult to open, there is always one DANGER SIGN as it may indicate too high pressure when firing the shot. All use shall stopped until the cause has been clarified and the condition has been corrected.

Unusual sounds and/or recoil

Weak or missing recoil can indicate a shot with a wrong load and the danger that the bullet sits in the barrel. This can especially occur when hand loaded ammunition is used. In such cases, it must be checked that the barrel is empty before firing another shot! Whistling sounds or sounds like opening a can of mineral water in connection with the shot, almost ALWAYS means that the BULLET IS STUCK IN THE BARREL. The rifle MUST be checked before a new shot is fired. "Double sound" or a clear delay between the trigger and the firing of the shot is signs of bad ignition. The firing pin and barrel must be checked before a new shot is fired.

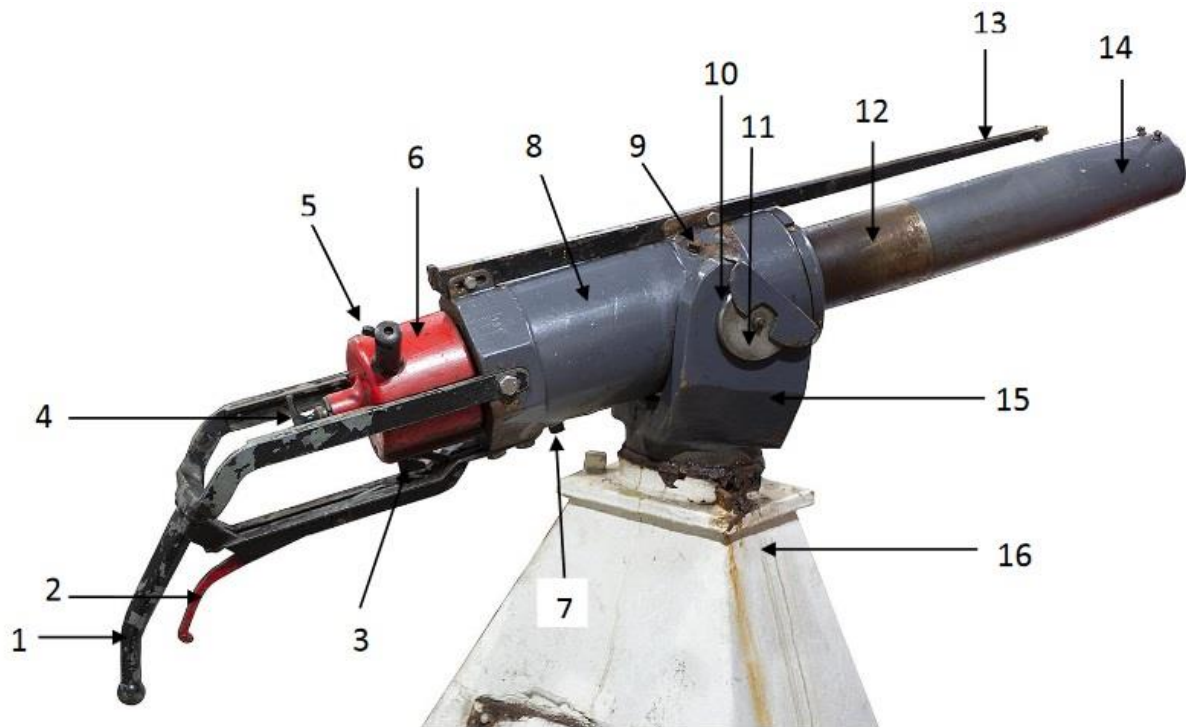
POOR HIT

- Bad ammunition
- Incorrect assembly or poor attachment of the mechanism to the rifle stock
- Rifle stock bend the barrel due to moisture
- Poor attachment of sights
- Bad cleaned barrels with lead, jacket and gunpowder residues
- Too much oil in the barrel
- Strong wind and/or cold
- Bad shooter

Shooting Accidents

This means shots that go off unintentionally. It can happen, for example, the shot goes off when the gun is loaded without pulling the trigger. This is most often the case for military-type semi-automatic rifles, but it can happen to any weapon if the firing pin protrudes from the breech end or primer caps protrude from the cartridge base (self-loading rifles).

Appendix I
I: 50 MM KONGSBERG CANNONS



1. Grip
2. Extractor
3. Trigger hook
4. Cocking handle
5. Safety
6. Breech end
7. Screw to drain glycerol
8. Cannon housing
9. Screw for refilling glycerol
10. Side bearing
11. Tap for side bearings
12. Recoil area
13. Sight
14. Cannon barrel
15. Cradle
16. Foundation/floor

Appendix II II: INSPECTION AND MAINTENANCE SCHEDULE FOR 50 MM AND 90 MM KONGSBERG CANNONS

Control before and during the hunt:

- Check that the foundation is firmly attached
- Check that the side bearings have no slack
- Check that the barrel and the housing have no slack oval or radial (back and forth) or axial (up and down)
- Visually check all welds on the barrel, cradle and foundation.
- Disassemble the breech block/cannon lock and clean all parts.
- Protect the parts with anti-rust oil (e.g. hydraulic oil) before assembly.
- Wash the cannon outside and inside. Feel free to use a rotary wire brush in the barrel, as well as hot water, high pressure w/detergent. Then oil the cannon with anti-rust gun spray or for example hydraulic oil.

Regular maintenance (during capture):

- Change glycerol before each season.
- Clean/check the channels of the breech block (50 mm cannon), cannon lock (90 mm) and spring w/firing pin and the gas channel minimum for every 10 shots. Protect it with anti-rust gun spray, alternatively hydraulic oil.
- Periodically check that the mechanisms is running easy and free.
- Periodically check the glycerol level.
- Protect the recoil area with acid-free, thin grease.
- If the cannon is leaking glycerol, the drain screw must be tightened (90 mm cannon) approx. 5 mm measured on the circumference (50 mm cannon). Then make a shoot test before possibly tightening it more.

Appendix III III:
INSPECTION AND MAINTENANCE SCHEDULE FOR THE 60 MM HENRIKSEN
CANNON

Control before and during the hunt:

- Check that the foundation is firmly attached
- Check that the side bearings have no slack
- Check that the barrel and the housing have no slack oval or radial (back and forth) or axial (up and down) – Visually check all welds on the barrel, cradle and foundation.
- Disassemble the firing mechanism and clean all parts.
- Place the parts in anti-rust oil (e.g. hydraulic oil) before assembly.
- Wash the cannon outside and inside. Feel free to use one rotating steel brush in the barrel, as well as hot water, high pressure with detergent. Then insert the cannon with anti-rust gun spray or for example hydraulic oil.
- Change glycerol before each season.

Regular maintenance (during capture):

- Clean/check the holes of the ignition mechanism, spring
- w/ ignition piston and gas channel minimum for each shot. Lubricate with anti-rust gun spray, alternative hydraulic oil. Check regularly
- control the mechanism to run easily and freely.
- Periodically check the glycerol level.
- Protect the recoil field with acid-free, thin grease.
- If the cannon leaks glycerol, the drain screw on the relevant side have to be tighten approx. 5 mm measured on the circumference. Test shots have to be fired then before possibly tighten more.
- When using the HHMV trigger mechanism on the cannon, the fastening bolt should be tightened until there is a axial clearance of approx. 1 mm between disc and mechanism. This is necessary in order to the firing mechanism must hang on the tail screw collar so that the bolt only acts as a pivot point.

Appendix IV

IV: CONTROL AND SAFETY TESTS OF WHALE GRENADE-99

Before Hvalgrat-99 was allowed to be transported and used for catching, it was the subject of a number of incidents mandatory, international safety tests before approval were given by the Norwegian Directorate for fire and explosion protection (DBE now DBS). Below, the following safety conditions were tested:

- detonation safety (detonation transfer, detonation protection, fire test)
- spontaneous combustion – drop test - loading, reloading (fall from 12 meters against a concrete base in a box)
- drop test - handling (drop of a grenade from 2 meters onto a concrete surface)
- fire tests (to assess the safety of fire crews in the event of a fire)

In addition, the grenades were tested for

- trigger safety
- tightness and function test by shot in water (boom shot)

Detonation transmission

This test was done to investigate whether one grenade could trigger the detonation of the others the grenades in the transport case should it go off accidentally. The test was carried out by detonate one of the grenades in the transport crate. The result showed that no other grenades were detonated, but the box was torn open and the inner packaging blown to pieces. The aluminum tube on the neighboring grenades were torn open, and the pentrite charges shattered, but there was no sign of explosives reaction.

Detonation protection

This test was done in connection with shot trials. The purpose of this test was to try whether the detonator could convert the main charge if the grenade was not armed, but was partially in secured position. The result showed that the grenades did not detonate.

Drop tests

These tests were carried out to investigate whether the grenades could go off in connection with transport and reloading, or during handling. During the "transport test", boxes of grenades were dropped 12 meters high against a concrete base. During the "handling test", grenades were thrown sideways, backwards and extended from a height of 2 meters towards the concrete base. The results showed that no shells detonated during the tests.

Fire tests

It was investigated whether the grenades would detonate in the transport box if there would be a fire where the grenades were stored. This was done by stacking several boxes of grenades into a bonfire which was then ignited and burned with violent heat generation for approx. 30 minutes. After the fire was extinguished, and the boxes cooled, they were opened and the contents inspected. The results showed that the inner packing in the boxes was charred. The grenades were damaged and in some grenades had the pentrite charge burned up but had not detonated in any shells.

Trigger safety

This test was done to investigate whether the grenade could be pulled off by accident for example in connection with handling the grenade or when retrieving the harpoon after a shot with a loose trigger hook. The tests showed that the grenade did not go off by pulling the hook the hands. With careful handling, it is therefore not dangerous to handle the grenade in an armed state or to take a harpoon with an armed grenade onto the deck.

Tightness and function test when shot in water

It was checked whether the grenade was waterproof when being underwater so that it could be reused.

This was carried out by shooting into the sea. The harpoon was then allowed to sink down to approx. 100m before it was taken up again. Several attempts were made without any damage or leakage being detected in the grenade. A grenade was shot a total of 12 times into the sea. After 40 days, the grenade was dismantled and inspected for humidity. No damage or leakage was detected. The grenade was later used for a catch and functioned normally.

The grenades passed all tests determined by the DBE without detonating, but the grenades were rendered useless after fire. After overall assessment, DBE placed Hvalgranat-99 in transport/danger class UN 1.4.D. Transport boxes etc accordingly marked with this number (symbol) or an affixed label for the information of all personnel who handle the product (For details on hazard classification, see http://www.unece.org/trans/danger/publi/manual/Rev5/English/01en_part1.pdf) pages 58- 60.

Hazard classification 1.4.D is relatively low (slightly higher than for ammunition for firearms which is 1.4.S, but lower than for the gunpowder used in the whale cannon) and meant in 2000 when the grenade became approved, that Hvalgranat-99 can in principle be transported by plane in the transport case.



FEBRUAR 2000

BRUKSANVISNING OG SIKKERHETSFORSKRIFTER FOR HVALGRANAT-99

For at Hvalgranat-99 skal fungere, må gjengeenden på harpunen være riktig tilpasset og ha riktig lengde (Figur 1). Granaten må skrus **helt inn** på harpunen for å armeres. Stoppkroken skal da helst stå midt mellom klørne.

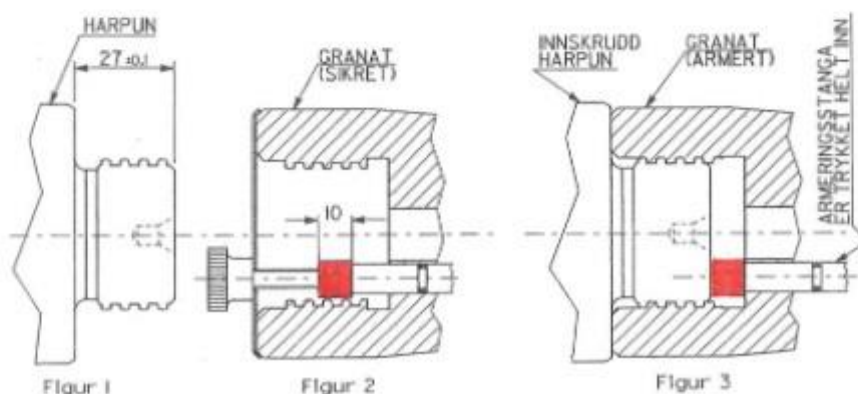
Armeringen skjer når granaten skrus på harpunen og den fjærbelastede stanga trykkes helt inn av harpunen (Figur 2 og 3). Armeringsstanga er synlig i gjengehullet på granaten. De ytterste 10 mm av stanga er rødmalt. Granaten er armert når bare den røde delen er synlig (Figur 3). Men slagfjæra er ikke spent om granaten er armert. Den spennes samtidig med at stoppkroken strammer utlørsersnora.

Når granaten skrus av harpunen, går armeringsstanga tilbake i utgangsposisjon (sikret posisjon). Dersom den ikke går helt tilbake, trekkes den tilbake med skruen til transportsikringslokket (Figur 2).

Monteringsanvisning

NB; Granaten skal alltid oppbevares i transportkasse.

1. Lad kanonen. Sett inn harpun og fest forløper
2. Ta ut en granat og fjern transportlokket
3. Skru granaten helt inn på harpunen. Dra godt til med hendene. Bruk ikke redskap da det kan skade granaten. Kan ikke granaten skrus på med hendene, er det feil med gjengene på harpunen
4. Når granaten tas av harpunen, skal den sikres med transportlokket og settes ned i transportkassa



KONTROLL AV SPRENGNING

For hvert avfyrt skudd kontrolleres det om granaten er sprengt. Ofte høres smellet fra detonasjonen i dyret. Har harpunen gått gjennom dyret, kan en se på granathylsa om granaten er sprengt. Har ikke harpunen gått gjennom, slik at granaten ligger inne i hvalen, skal den skjæres ut når hvalen flenses.

Blindgjengere

Sitter den røde hylsa på plass, er ikke granaten sprengt. Sitter stoppkroken på plass, er granaten sikker å håndtere. Er stoppkroken løsnet eller snora slitt av, må granaten behandles som blindgjenger inntil det kan kontrolleres om armeringsstanga er gått tilbake i sikret posisjon.

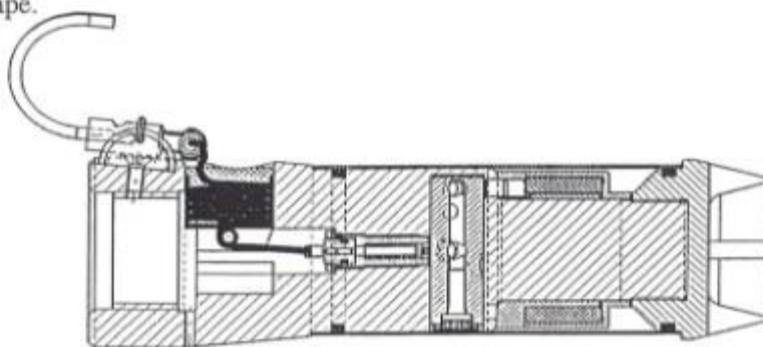
Dersom granaten er en blindgjenger, og armeringsstanga ikke går tilbake av seg selv, forsøker en å trekke den tilbake til sikret posisjon med skruen i transportlokket. Deretter settes transportlokket på, og granaten oppbevares i transportkasse til den skal destrueres. Lykkes en ikke med å sikre granaten, klippes snora dersom stoppkroken sitter på, og granaten settes i egen kasse inntil destruksjon.

Bomskudd

Ved bomskudd vil ikke granaten detonere. Den kan trekkes inn igjen på dekket og brukes på nytt. Under innhalingen må en passe på at stoppkroken ikke rives løs da granaten er armert. Et trekk i snora på 50 – 70 kg kan få granaten til å detonere. **TREKK ALDRI I SNORA.**

Når harpunen er halt inn på dekket, skrus granaten av. Det kontrolleres at armeringsstanga går i sikret posisjon før den brukes om eller settes i transportkassa med transportlokket på.

Dersom stoppkroken er revet løs på grunn av streifskudd eller lignende, kan den festes ved hjelp av de vedlagte brytepinner. Snora legges ned i koppen og festes med tape.



Figur 4 Hvalgranat-99 (gjennomskåret)
i ikke armert posisjon

Appendix VI APPENDIX VI: NORWEGIAN REGULATIONS IN WHALING

Requirements for catching equipment

Vessels that will participate in the capture of minke whales must have the following capture equipment:

- a) Cannon of caliber not less than 2" (50 mm) mounted in an iron gun carriage. The bow of the vessel shall be sufficiently braced, so that the bollard does not cause major failure in the upper edge when the shot is detached than 1/4" (6 mm).
- b) Rifle caliber 9.3 mm (366) or larger.
- c) At least 1 two-clawed harpoon per awarded animal, still limited to 7 harpoons. The harpoons must have a distance between the tips of the claws (extended) of at least 15" (38 cm). 50 mm harpoon shall weigh between 13.5 kg and 14.5 kg. The 60 mm harpoon should weigh between 15.5 kg and 16.5 kg. Other types harpoons can be used, ("Lorentsen harpoons"), if the weight difference between the harpoons does not exceed 0.5 kg. On all harpoons, harpoon legs and claws must withstand a stretch of at least 5000 kg. Confirmation must be submitted that the harpoons have been tensile tested. It is forbidden to use different types of harpoons during the catch.
- d) At least 3 precursors, each of which is not less than 60 m. The precursors of the Spektron type or corresponding material must have a minimum thickness of 12 mm in diameter. Precursors of nylon must have a minimum thickness of 16 mm diameter.
- e) Suspension device which can withstand a tension of at least 5000 kg and which has a travel of at least 1.5 m
- f) Machine-driven winch for raising and raising the whale. The game must withstand a load of at least 5000 kg and have a pulling power of at least 2500 kg.
- g) The vessel shall have a barrel attached to the mast. The barrel must be painted white, with a black 30 cm wide circumferential belt in the middle of the barrel. The Directorate of Fisheries can in special cases exempt from this provision.

Requirements for rifle and ammunition

For the killing of minke whales that have not been killed with a harpoon shot, a rifle caliber 9.3 mm must be used (366) or larger fully jacketed, round-nosed ammunition with an impact energy of at least 350 kgm at 100 m. It is forbidden to use ammunition with a lead tip.

Firearms and ammunition must always be kept at the stand during the catch (in immediate proximity of the cannon). Firearms must be approved by the gunmaker and loaded with such ammunition as will be used during the catch

