

**REPORT ON WEAPONS, TECHNIQUES,  
AND OBSERVATIONS IN  
THE ALASKAN BOWHEAD WHALE SUBSISTENCE HUNT**

Prepared by the Alaska Eskimo Whaling Commission

Submitted by the United States of America  
to the  
Subcommittee on Whale Killing Methods  
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**INTRODUCTION**

***The Alaska Eskimo Whaling Commission (AEWC)***

The AEWC is a not-for-profit entity composed of the ten coastal subsistence whaling communities in the Alaskan Arctic – ranging from the Villages of Gambell and Savoonga on St. Lawrence Island in the Bering Sea and the Village of Little Diomed on Little Diomed Island, to the Village of Kaktovik on Barter Island in the Beaufort Sea near the Canadian border. The culture and the social structure of these SiberianYupik and Inupiat Native communities are built around the annual subsistence harvest of the Bering-Chukchi-Beaufort Seas stock of bowhead whales. In this paper, any reference to “bowhead whales” is to this stock.

***The Bowhead Whale Subsistence Hunt***

The Alaskan Eskimo subsistence hunt of bowhead whales is conducted pursuant to the regulations of the IWC Schedule; U.S. law; and the AEWC Management Plan, approved by the U.S. Government. The hunt takes place from small boats using hand-held weapons. The use of small boats and hand-held weapons requires hunting crews to approach the whale at very close range, positioning themselves to be virtually on top of the whale when it is struck.

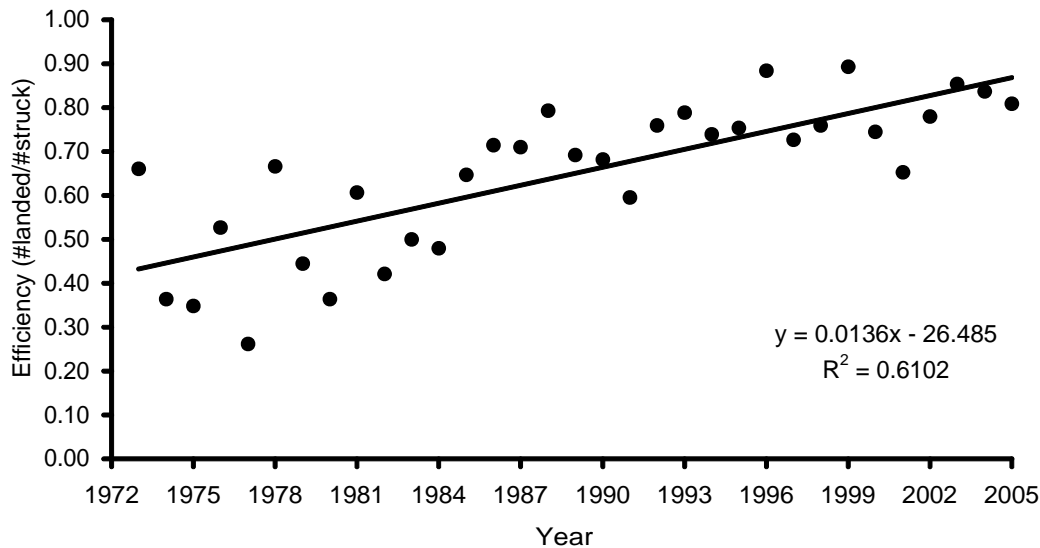
Eight of the ten subsistence whaling villages hunt in the spring as bowheads migrate north and east from the Bering Sea to the Canadian Beaufort Sea through the spring ice leads. This hunt is conducted from the edge of the shore-fast ice using wood-framed boats made by hand with walrus (St. Lawrence) or bearded seal skin and thread fashioned from caribou sinew. Because whales must be taken in an ice-covered ocean, some of the struck whales inevitably slip under the ice, where they may be lost.

Three of the villages hunt in the fall as the bowheads that summer in the Canadian Beaufort migrate west and south through the Alaskan Beaufort Sea and into the Chukchi Sea. This hunt is conducted from small skiffs with outboard motors in ice-choked waters and under conditions that often include high winds and rough seas.

Because of the treacherous conditions in which the bowhead whale subsistence hunt is undertaken, it is considered to be extremely dangerous, and fatal accidents are a fact of the hunt. During a recent hunt in Barrow, one of the most experienced harpooners in the Arctic was killed when his boat capsized while towing a whale; he was trapped under it. In March of this year, a prominent subsistence hunter from the village of Pt. Hope was killed when sea ice moved in and crushed him while he was opening a trail on the land-fast ice, in preparation for the spring bowhead whale hunt.

### *Efficiency in the Bowhead Subsistence Hunt*

Historically, the efficiency in the bowhead whale subsistence hunt averaged approximately 50 percent. In 1978, the AEWI committed to the IWC that it would increase that efficiency to an average of 75 percent. In recent years, the average efficiency rate in the bowhead subsistence hunt has been at least 75 percent and in some years well above 80 percent.



### **WEAPONS USED IN THE ALASKAN BOWHEAD WHALE SUBSISTENCE HUNT**

#### *Primary Weapon*

The primary weapon used in the Alaskan Eskimo bowhead whale subsistence hunt is a hand-held darting gun, armed with an explosive projectile and a harpoon that attaches a line and float to the whale to assist in recovery.<sup>1</sup>

#### Brief History of the Darting Gun

*A black powder-loaded projectile has been used for approximately 150 years as the explosive projectile loaded into the traditional hand-held darting gun and shoulder gun:* Inupiat and Siberian Yupik people of the northern and western coasts of Alaska have hunted bowhead whales for thousands of years. Early hunting equipment consisted of hand-held spears with points made of stone or bone. In 1847 and 1848, the North Pacific commercial exploitation of whales began in the Okhotsk and Bering Seas and ended for the Bering, Chukchi, Beaufort Seas (BCBS) stock of bowhead whales around 1914 (Montague, 1993). By the end of Yankee commercial whaling activities (1849 to 1914) 18,650 whales were estimated to have been killed (Bockstoce, 1986), dramatically decreasing the BCBS population. This industry severely depleted the BCBS stock, as well as other marine mammal stocks, especially walrus and gray whales. This caused serious starvation-related declines in the indigenous human population of coastal Alaska. The human populations also suffered further severe declines due to the introduction of disease through contact with the Europeans.

<sup>1</sup> For a detailed description of the darting gun, see Ingling, 1995.

Contact with Yankee whalers caused the Native people to change their hunting techniques as they incorporated new technologies in the form of the darting gun, the shoulder gun, and the black powder exploding projectile (the black powder projectile). These tools are still used in combination with traditional Eskimo whaling methods (shorefast ice-based operations) and equipment, (bearded seal, *Erignathus barbatus*, skin boat or umiaq), and some modern equipment (i.e. small outboard boats in the fall).

While far more successful and humane than hand-held spears with stone or bone heads, the black powder projectile is limited and dangerous to use in that it is loaded with an old low-power explosive (black powder), has a fusing system that can be unreliable, and ignition of the fuse occurs in the barrel of the gun (Ingling, 1995). Until recently, no alternatives to the black powder projectile were available to Alaskan Eskimo subsistence hunters.

However, since 1987, the AEWG through its Weapons Improvement Program Committee (WIP Committee) has worked closely with Dr. Egil Ole Øen and Henriksen Mek. Verksted of Norway on the design, testing, and manufacture of a penthrate-loaded projectile for use in the hand-held darting gun. In the course of developing the penthrate projectile, the AEWG and Dr. Øen also found it necessary to modify the design of the darting gun barrel to accommodate the dimensions of the new projectile. The work undertaken in the course of developing the penthrate projectile has been the subject of numerous reports to this Working Group and to the IWC Workshop on Whale Killing Methods. A detailed summary of the work on the darting gun barrel is provided in Alaska Eskimo Whaling Commission, 2005.

### ***Secondary Weapon***

The secondary weapon used in this hunt is a smooth bore, seven gauge shoulder gun used to shoot a finned projectile loaded with black powder. Under traditional practices and the rules of the AEWG Management Plan, the shoulder gun cannot be fired until after a line and float have been attached to the whale. Therefore, the shoulder gun is fired following delivery of the darting gun, usually immediately after to help ensure a quick kill.

### ***Overview of AEWG Weapons Improvement Program for the Hand-Held Darting Gun***

#### ***Development of the Penthrate Projectile***

Since 1977, the AEWG has pursued technical research and development designed to improve the safety and efficiency of the weapons used in the Alaskan Eskimo subsistence hunt of the bowhead whale. The most important guiding principle of the AEWG's Weapons Improvement Program is the need to ensure human safety. With the introduction of penthrate, caution is imperative due to its extraordinary explosive power and thus the potential for extreme danger in this hunt, where the crews are only feet from the whale when the darting gun is fired. Thus the penthrate projectile is equipped with a fuse head that serves as a "safe and arming mechanism" (SAM). The SAM is designed to ensure that the projectile detonates only after entering the whale to a safe depth. Redundant safety measures are included to prevent detonation if the projectile is dropped. For added safety, the projectile body and fuse head are delivered separately and are not joined until the crew is prepared to begin hunting.

Work on the development of the penthrate-loaded projectile for the hand-held darting gun began in late 1987 and was largely concluded by 1998.<sup>2</sup> During this period, bench trials of the penthrate projectile were conducted at Henriksen Mek. Verksted, with accompanying field trials in Barrow, Alaska. The penthrate projectile was not used in the bowhead subsistence hunt during 1993, 1994 or 1996, due to the need for modifications based on experience in field trials in each of the previous years.

The Barrow field trials included post-mortem examinations, by North Slope Borough Department of Wildlife Management biologists and veterinarians, of whales landed using penthrate. After 1998, field trials revealed the need for further modifications to the projectile, in particular reinforcement of the connector between the fuse head and the tubular body, as well as reinforcement of the tip of the fuse head. This work was carried out in 2000 and 2001.

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<sup>2</sup> For a more detailed review of early modifications to the penthrate projectile, see Appendix A to Alaska Eskimo Whaling Commission, 1995

Modification of the Darting Gun Barrel

The Barrow field trials also revealed the need for modifications to the historic design of the darting gun barrel to accommodate the size and shape of the new projectile. Since 2001, the WIP Committee and Dr. Øen have concentrated their work on modifications to the darting gun, itself, to adapt the weapon to the penthrate projectile, and on the education and training of hunters in the use of the penthrate projectile. Field trials of the penthrate projectile continued in Barrow through 2004 in support of this work.<sup>3</sup>

Use of the Penthrate Projectile in the Alaskan Bowhead Whale Subsistence Hunt (2003-2006)<sup>4</sup>

2003 Spring and Fall Bowhead Whale Subsistence Hunts in Barrow, Alaska

As discussed above, field trials of the penthrate projectile and modified darting gun barrel continued in Barrow through 2004. During the 2003 Alaskan bowhead hunt, five whales were taken with penthrate used as either a primary or secondary (second darting gun shot from crew other than the first strike crew) projectile, three in the spring and two in the fall. In all cases, the penthrate projectiles and modified darting gun barrels performed properly. Two of the whales taken with penthrate stopped moving almost immediately after being hit with the penthrate explosive (03B3, 03B4).

Due to delays in production and shipment of modified darting gun barrels, only a small number of Barrow crews were given penthrate projectiles for use during the 2004 spring and fall hunts. None of these crews had an opportunity to use the penthrate.

2005 Spring and Fall Bowhead Whale Subsistence Hunts in Barrow, Nuiqsut, and Kaktovik, Alaska

This was the first year of the Alaskan bowhead subsistence hunt after the AEWI WIP Committee and Dr. Øen determined that field trials could be concluded and the penthrate projectile and modified darting gun barrel could be distributed to villages outside of Barrow. As discussed below, training and certification workshops were held in Nuiqsut and Kaktovik prior to the fall hunt in those villages and captains certified in the use of the penthrate projectile were given a projectile and new darting gun barrel.

During the 2005 spring hunt, two whales were taken in Barrow with the penthrate projectile and modified darting gun. One whale, shot near the base of the skull on the left side, appeared to die “instantaneously.”

During the fall hunt, six whales were taken using penthrate, two in Barrow, one in Nuiqsut, and three in Kaktovik. A minor malfunction occurred when one of the penthrate projectiles was shot without removing the safety pin. Still, the projectile exploded safely, and the whale appeared to die quickly. One of the Kaktovik whales (05KK2), taken with a single penthrate projectile and struck approximately 1.5m behind the blowhole, appeared to die very quickly. According to the crew, upon being struck, the whale “shook, slapped its flipper, and died.”

2006 Spring and Fall Bowhead Whale Subsistence Hunts in Barrow, Nuiqsut, Kaktovik, and Wainwright, Alaska

Hunting conditions during spring 2006 were very challenging. Ice and weather conditions prevented hunters from six villages (Savoonga, Gambell, Little Diomed, Wales, Kivalina, and Point Hope) from landing a whale. Only crews at Wainwright and Barrow successfully landed whales (5 total) during the spring migration. Wainwright crews took the first whale of the season on 10 May and another on 11 May. The hunters used penthrate on the second whale and reported a very short time-to-death. At Barrow, three whales were taken between 11 and 18 May. One of these was taken using penthrate, and the whaling captain reported that it died quickly.

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<sup>3</sup> For a detailed overview of the AEWI Weapons Improvement Program for development of the penthrate projectile used in the hand-held darting gun, and modifications to the darting gun, see Alaska Eskimo Whaling Commission, 2005.

<sup>4</sup> For a discussion of prior years’ results of the use of the penthrate projectile in the Alaskan bowhead whale subsistence hunt, see Alaska Eskimo Whaling Commission 1995, 2003, 2005.

During the fall hunt, of the 19 whales taken at Barrow, two were taken with the penthrate projectile and the modified darting gun, and were described as “instant kills.” Four whales were taken in Nuiqsut; one of these was taken using penthrate and the modified darting gun. The whale was reported to have died very quickly. In Kaktovik, three whales were landed, but none using penthrate and the modified darting gun.

#### HUNTER TRAINING AND CERTIFICATION

Hunter training is an ongoing priority of the AEWEC and its captains. Several of the villages hold hunter training workshops as part of their meetings prior to each bowhead whale subsistence hunt. In addition, the AEWEC holds a weapons workshop/hunter training session as part of its annual meeting. This workshop is always well-attended as it offers an opportunity for young hunters to receive instruction to upgrade their skills, as well as an opportunity for more experienced hunters from the different villages to share successful techniques.

In keeping with the AEWEC’s commitment to hunter safety, a key component of the AEWEC’s Weapons Improvement Program for the new projectile has been the preparation of a handbook on its function and proper use, along with a training video. The WIP Committee prepared these items, working in cooperation with Dr. Øen. The handbook was published in February of 2004, and **the AEWEC now requires that**, before they are entitled to receive penthrate projectiles or a new darting gun barrel, **all captains must be certified** in the use of the penthrate projectile and modified darting gun barrel through a training course based on the handbook and administered by the WIP Committee.

The Chairman of the AEWEC and the Chairman of the WIP Committee have worked together providing training courses in Barrow.

##### 2005-2006 Training/Certification Sessions

Harry Brower, Chairman of the AEWEC, and Eugene Brower, Chairman of the AEWEC’s WIP Committee conducted training and certification sessions for captains and harpooners in the villages of Nuiqsut and Kaktovik in August 2005. The Chairman of the WIP Committee, with the assistance of an AEWEC staffer, conducted a training and certification session in the village of Wainwright in March 2006.

Training and certification are focused on the function and proper use of the penthrate projectile and the modified darting gun barrel. During each village session, the Chairmen cover how to prepare the penthrate projectile and how it works with the modified barrel.

As with all WIP training sessions, great emphasis is placed on the importance of striking the whale between the base of the neck and the diaphragm, since explosion in the thoracic cavity will lead to rapid insensibility and death. The sessions thus far have gone extremely well. Six captains in Nuiqsut, nine captains in Kaktovik, and eight captains in Wainwright all received their certification along with a penthrate projectile and modified barrel.

##### 2007 Training/Certification Sessions

Unfortunately no further training or distribution of penthrate projectiles could be conducted in outer villages because projectiles could not be ordered pending a solution to a problem involving a component of the delay fuse. At this time, a new shipment of 100 projectiles is expected for fall 2007, with a second shipment of the same size planned for 2008. With the new shipments, the AEWEC anticipates completion of the village training sessions.

#### HUNTING EFFICIENCY AND RECOVERY METHODS

The AEWEC made a commitment to the IWC in 1978 to increase efficiency in the Alaskan bowhead whale subsistence hunt from an average of 50-percent to an average of 75-percent, and since that time has made improving the efficiency of this extraordinarily difficult and dangerous hunt one of its highest priorities. In recent years the average efficiency rate has been at least 75 percent and in some years has exceeded 80 percent. For the last 11 years (1996-2006) the average efficiency was 79.4% (STD= 0.08). However, efficiency in any given year is heavily affected by sea, ice, and weather conditions during the bowhead migration.

The majority of struck and lost whales occur during the spring hunt because hunting is especially difficult then. The spring hunt is conducted from the edge of the shore-fast ice as the whales migrate north through cracks, called leads, formed between shore-fast ice and the circulating ice pack. Depending on the current and the whale's momentum, ice movement can pull a struck whale under the ice, even if the whale is killed quickly. This happened at least twice during the spring 2006 hunt. When this occurs every attempt is made to recover the whale. Even "stinkers" may be salvaged for muktuk.

The AEWC uses a multi-faceted approach to improving the efficiency of the Alaskan bowhead hunt. In addition to the weapons improvement work, hunters have added "pingers" to some of the floats used in the hunt to increase the chances of recovering lost whales. When a whale is lost, local search and rescue operations will join the hunters in the attempt to locate and recover the whale. Finally, as noted, the AEWC has renewed focus on hunter training, including a return to more traditional methods of training young harpooners, such as target practice using ice/snow banks.

In general, while there can be significant year-to-year variability, the multi-year average represents a substantial improvement over historic rates. See table below.

Table of Efficiency Rates for the Alaskan Bowhead Whale Subsistence Hunt in Recent Years

Year of Hunt	# Landed	# Struck	Efficiency (%)
1996	38	43	88.4
1997	48	66	72.7
1998	41	54	75.9
1999	42	47	89.4
2000	35	47	74.5
2001	49	75	65.3
2002*	39	50	78
2003	35	41	85.4
2004	36	43	83.7
2005**	55	68	80.9
2006	31	39	79.5
11 Year Average of yearly % efficiencies			79.4

\* Two whales abandoned due to weather, high seas.

\*\* One whale abandoned due to weather, high seas and ice.

In 2006, 39 bowhead whales were struck, resulting in 31 animals landed. The efficiency (# landed / # struck) of the hunt was 79.5%, which is similar to the average during 1996-2005 (mean = 79%, *SD* = 8%).

Of the landed whales, 21 were males and 10 were females. Of the females, only one was presumably mature (>13.4m in length) and she was not discernibly pregnant (however, the animal was harvested in a remote village and could not be closely examined by biologists).

The average number of whales landed in the 10 previous years was 41.8 (*SD* = 6.8). Thus, the harvest for 2006 was slightly lower than recent years. Challenging sea ice and weather conditions in the spring precluded 6 of the 8 spring-whaling villages from landing any whales. The spring harvest was the lowest recorded in the last

35 years and only the villages of Wainwright and Barrow were able to land five whales during the spring hunt. Fall harvests in the Beaufort Sea villages (Kaktovik, Nuiqsut and Barrow) were consistent with past years. In the Bering Sea, the St. Lawrence Island villages of Savoonga and Gambell were not able to land any animals during the fall hunt.

### **WHALE KILLING METHODS WORKSHOP 2006**

The IWC held a Whale Killing Methods Workshop at the 58th annual meeting in St. Kitts. The workshop agenda was designed to allow hunters from aboriginal subsistence whaling countries to present the details of their hunts and for any person with direct, professional experience in whale mortality to discuss methods, ask questions, and express concerns. The Workshop Terms of Reference required that the participants make recommendations in the context of crew safety priorities, and bearing in mind the limitations of funding for aboriginal subsistence hunters.

The Workshop participants agreed to eleven recommendations, which are attached to this Report as Attachment II.

Nine of the eleven recommendations adopted by the 2006 Whale Killing Methods Workshop are an integral part of the AEWI's Weapons Improvement Program. (Recommendations 5 and 11 are action items for member countries only.)

Several Workshop recommendations focus on hunter training for safety and humane killing purposes. The AEWI places a very high priority on certification and training in the proper use of the penthrate projectile and the modified darting gun. Training is required of captains and crew in each village, with a workshop offered at the AEWI's annual meeting. The focus of these certification and training sessions is the safety of hunters and shot placement for the most effective use of the projectile and swift death of the whale. See Workshop recommendations 1-4 and 6-10.

The Workshop participants also recommended use of best weapons technology and training to continue progressing toward the achievement of the fastest possible death for the whale, and the development of the Aboriginal Subsistence Whaling Caucus to exchange information and best practices. In keeping with this recommendation, the AEWI Weapons Improvement Program is predicated on the development, with veterinarian Dr. Egil Øien of Norway, of the penthrate projectile as a replacement for the less effective black powder grenade left over from the Yankee whaling days. In addition, the AEWI was not only a participant in the first ever Aboriginal Subsistence Whaling Caucus in 2006, but provided a leadership role in that meeting. The AEWI expects to continue participating in and promoting the goals of the Aboriginal Subsistence Whaling Caucus. See Workshop recommendation 2.

The AEWI also aids the U.S. government in fulfilling recommendation 4, which calls for member countries to support their scientists and vets in studying welfare aspects and monitoring and improving welfare techniques. As noted above, the AEWI collaborates with Dr. Øien on weapons technology, co-manages bowhead whale welfare through its cooperative management agreement with the U.S. National Marine Fisheries Service, and assists the North Slope Borough Department of Wildlife Management in supplying samples of whale tissue for welfare and other purposes. The AEWI obtains funding for, and promotes the achievement of, the most advanced scientific research available on the bowhead whale. See Workshop recommendation 4.

Workshop recommendations further include improvement of accuracy of primary and backup shots, targeting areas of the brain and upper neck, and the practice of re-shooting a whale that shows signs of life. These goals have always been key tenets of hunter training protocol under the AEWI Weapons Improvement Program. Younger hunters are indoctrinated in the ways of bringing about a humane death for the whale by aiming for the base of the skull or the thorax. As a matter of safety, hunters must re-shoot immediately when a whale that is assumed dead moves unexpectedly. See Workshop recommendations 6, 7, and 8.

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## ATTACHMENT I

### OVERVIEW OF PENTHRITE PROJECTILE DESIGNED FOR THE ALASKAN BOWHEAD WHALE SUBSISTENCE HUNT

This overview was adapted from an explanation of the penthrite projectile and its development for use in the Alaskan bowhead whale subsistence hunt, prepared by Dr. Egil Øen.

#### The explosive

Penthrite (Pentaerythritol Tetranitrate or PETN) belongs to the so-called secondary explosives customary used for demolition purposes etc. It is regarded to be non-toxic and does not affect the usefulness or taste of whale meat because it does not dissolve in water and upon detonation it breaks down into natural gases and water. Also, penthrite is thermally the most stable and least reactive of its category of explosives. Curiously enough in recent years, it has also been used for medical treatment in the therapy of angina in humans and animal data suggest that it also might have antiatherosclerotic effects.

A Norwegian study of harvests and post mortem of more than 5000 minke whales shows that penthrite is very efficient in causing the (minke) whale to become unconscious almost instantly and causes quick death by producing “pulses” of shock and pressure waves that travel at supersonic speed in all directions, causing severe damage to vital organs. Injuries and bleeding are often found in the brain, heart, lungs and other vital organs. Therefore, if used correctly, and properly aimed, penthrite projectiles or grenades are both safer and more effective and kill the animals faster than grenades with conventional explosives. It is more powerful and a hunter may take aim at a broader area of the whale’s body to achieve a rapid death in comparison to the traditional black powder grenade. Even so, hunters can expect the most rapid death only when the grenade explodes in or near the chest, spine, neck, and skull which are the most vulnerable regions. In the Norwegian hunt of minke whales an 80% rate of instantaneous kills is achieved compared to 17% in the beginning of the 1980s.

#### The projectile

The penthrite projectile for the darting gun is composed of two major parts:

A head (Fig. 1) comprising the firing mechanism with pyrotechnical devices, arming devices, and a number of safety devices. The sequence of operation contributes to a high degree of safety as the operation of the various devices in the projectile head must occur in the pre-determined sequence to fire the main charge in the bomb at penetration into the whale.

The bomb is a shaft or tubular body (Fig. 2) which is attached to the rear end of the head before the darting gun is loaded.

At transport these parts are held separately.

#### Manner of operation

When the darting gun has been fired, the projectile will plunge into and penetrate the tissues (muktuk and musculature) of the whale. When the front end of the head hits the target, the striking force at penetration will break a shear pin through the plunger allowing the plunger with the striker pin to be forced backwards against a stopper device and the time delay fuse. The striker will ignite (activate) the time delay fuse after penetrating to the predetermined depth.

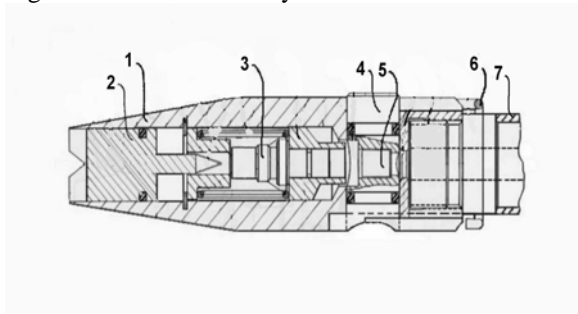
Having been activated by the striker pin, the time delay fuse starts burning and continues burning for approximately 4.5 seconds.

Upon further penetration of the head, the “stirrup” will be hit by the surface of the whale, disrupting another shear-pin and moved to a position flush with the shaft. At this movement of the stirrup, a detonator is moved in a position where it can be ignited by the delay fuse. At the rotation movement the detonator is aligned and in close contact with the burning time delay fuse at one end and the penthrite charge in the shaft at the other end. In this aligned position, the detonator is ready to set off the penthrite charge once it has been triggered by the time delay fuse after 4.5 seconds.

If the detonator housing is rotated accidentally before the time delay fuse has been ignited, the time delay fuse will move immediately into the detonator housing and be safely away and out of reach from the striker pin. Accordingly, the striker pin cannot ignite the time delay fuse and no detonation can occur accidentally.

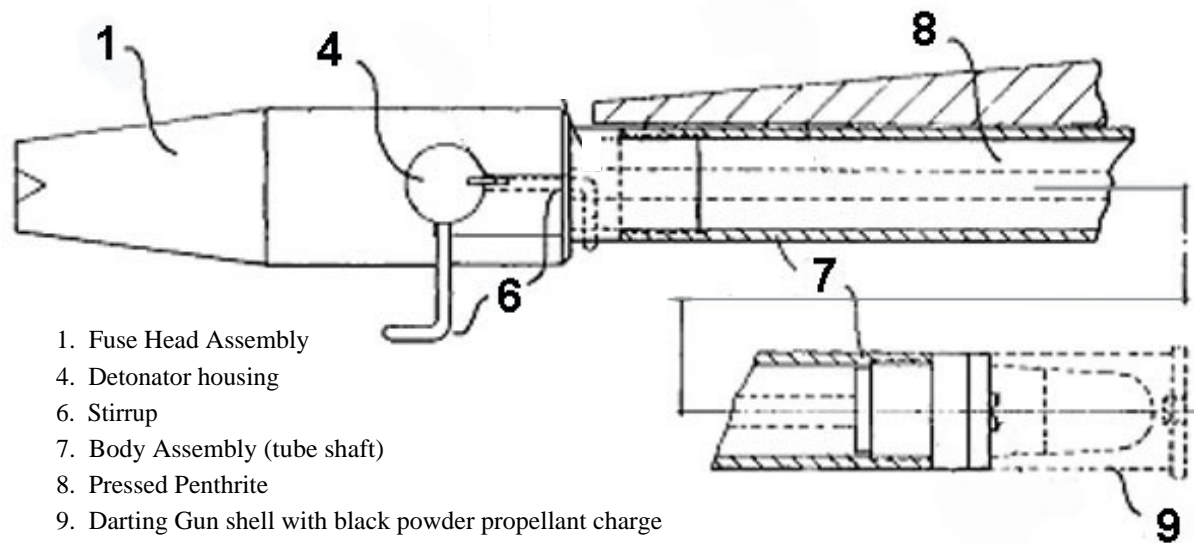
#### Diagram of penthrite projectile for Bowhead whale

Fig. 1. Fuse head assembly



1. Housing of Fuse Head Assembly
2. Ignition plunger with striker pin
3. Time Delay Fuse
4. Detonator housing
5. Detonator
6. Stirrup in activated (armed) position
7. Body Assembly

Fig. 2. Penthrite projectile: Fuse Assembly and Body Assembly



**ATTACHMENT II**

**RECOMMENDATIONS OF THE PARTICIPANTS  
OF THE WHALE KILLING METHODS WORKSHOP**

1. To encourage continued efforts in training and dissemination of good practice around the world, for example in promotion of, and further investigation of, the use of heart shots from back up rifle where the head of the animal is under the water.
2. Recommend the best possible type and calibre weapon is used in aboriginal subsistence whaling and continue weapon technology improvement for use in aboriginal subsistence whaling with particular focus on calibre of weaponry. Encourage the development of the aboriginal subsistence whaling caucus to further the exchange of information and best practice.
3. Recommend continued efforts to improve accuracy of placement of primary and back-up shots, to continue improvements towards achieving instantaneous death.
4. Recommend continuing efforts to improve back up/secondary killing methods. Recommend that governments continue to support their scientists and vets in studying welfare aspects and monitoring, evaluating and improving welfare techniques, and to publish the data.
5. Member countries of the IWC exchange information on methods for dealing with entrapped, entangled and stranded cetaceans, drawing on the domestic protocols of member countries; and to review the methods used to euthanase cetaceans at sea when entangled in fishing gear or marine debris.
6. When using explosive devices, for welfare reasons whales should whenever possible be shot from the side at the thorax or neck and all animals should if possible be hauled in as fast as possible to control if the animal needs to be re-shot.
7. When using the rifle as back-up, the recommended target areas are the brain, upper neck and in emergency situations possibly the heart.
8. As a precaution, the hunters should be recommended to re-shoot as a routine any animals that move or in other ways show any signs of life.
9. Recognise the importance of hunter training for the improvement of hunters' safety, animal welfare and minimising struck and lost rate.
10. Recognise the importance of maintaining weapons and hunting gear.
11. Encourage in two years time when progress can be assessed, consideration of the holding of a further scientific and technical Workshop.