DAILY TIMES

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Mushroom cloud threatens Glasgow as N-sub explodes

By Justin Long, Defence Editor

The fate of thousands hangs in the wind today as a deadly cloud of highly radioactive particles threatens to fall on Glasgow.

The cloud formed high in the sky as a Royal Navy Polaris submarine blew up and sank in the Clyde estuary early this morning.

Evacuation plans are already underway. But the local population have been warned to stay in doors with windows and doors sealed wherever possible.

The tragedy began late last night as the Polaris submarine entered the Firth of Clyde. It is believed she was limping home after an incident in the North Atlantic.

A fire is believed to have started in the machinery space of the 24 year old nuclear powered submarine. As to control the fire, the submarine's reactor was heading out of control. Shortly after surfacing the reactor finally ran wild and exploded, throwing highly radioactive debris a mile into the sky.

It is not yet clear whether the crew of 120 were evacuated to safety before the submarine finally sank in 300 feet of water.

Concern is now mounting over the safety of the sixteen nuclear tipped Polaris missiles, each equipped with three Chevaline warheads, believed to be carried on board.

Panic broke out all along the Clyde as major roads became blocked. A spokesman for the Strathclyde Emergency Services said, " we are just not prepared for the scale of this accident. We do not have the evacuate even the most at risk areas. I don't know how we are going to cope."

The submarine's nuclear reactor - the P1 pressurised water reactor built by Rolls Royce and Associates - has had a history of suspected cracks. This fault is believed to have been the main cause for the withdrawal from active service of at least five other submarines with similar nuclear reactors.

Government defence officials have stated that this submarine had been cleared for sea by the Warships Safety Committee, but have declined to comment on the possible connection between the sinking and suspected reactor fault.

Experts predict that if the inshore winds do not abate the radioactive cloud could pass over the centre of

THE SUNDAY RECORD 10 NOVEMBER 1991

Diary of a disaster:

In the wake of the worst disaster since Chernobyl, the extraordinary details which led to the sinking of a Royal Navy Polaris submarine have just been released. Bill Smart reports.

Deep in the North Atlantic hundreds of miles west of Scotland alarm bells began ringing in the Soviet "attack" submarine Kamsolov as it shadowed the British Polaris submarine on patrol. It had just collided with what it suspected was another submarine. It would be another two days before the Soviet captain would know the full extent of the damage - first he had to shake off a British attack submarine which was now in close pursuit.

Eventually when he reached home he would find that the propeller of the Polaris boat he had been trailing had torn half the length of his outer hull, missing a main hatch by inches. Had the hatch been damaged his submarine would certainly have sunk.

Meanwhile the Polaris submarine at first appeared to have suffered only minor damage to her propeller and steering gear.

Although this was considered serious enough for her to request to be withdrawn from patrol. Receiving clearance she began her limp home to base at Faslane on the Clyde.

As she entered the Firth of Clyde still submerged, a worst nuclear accident the world has witnessed since Chernobyl.

A fire began in the after end of the machinery space when oil spewed from the hydraulic line. The fire quickly spread throughout the whole of the machinery space. The crew scrambled to emergency stations. Steering and depth control were lost. A rapid decision was made to surface in emergency. High pressure air began to fill the main ballast tanks and slowly lift the crippled submarine to safety. Essential electrical supplies failed. The reactor was rapidly shut. For vital minutes there was confusion as the command tried to establish the exact state of the submarine.

With the submarine on the surface reports were made that the reactor was becoming impossible to control.

The order was given to abandon ship.

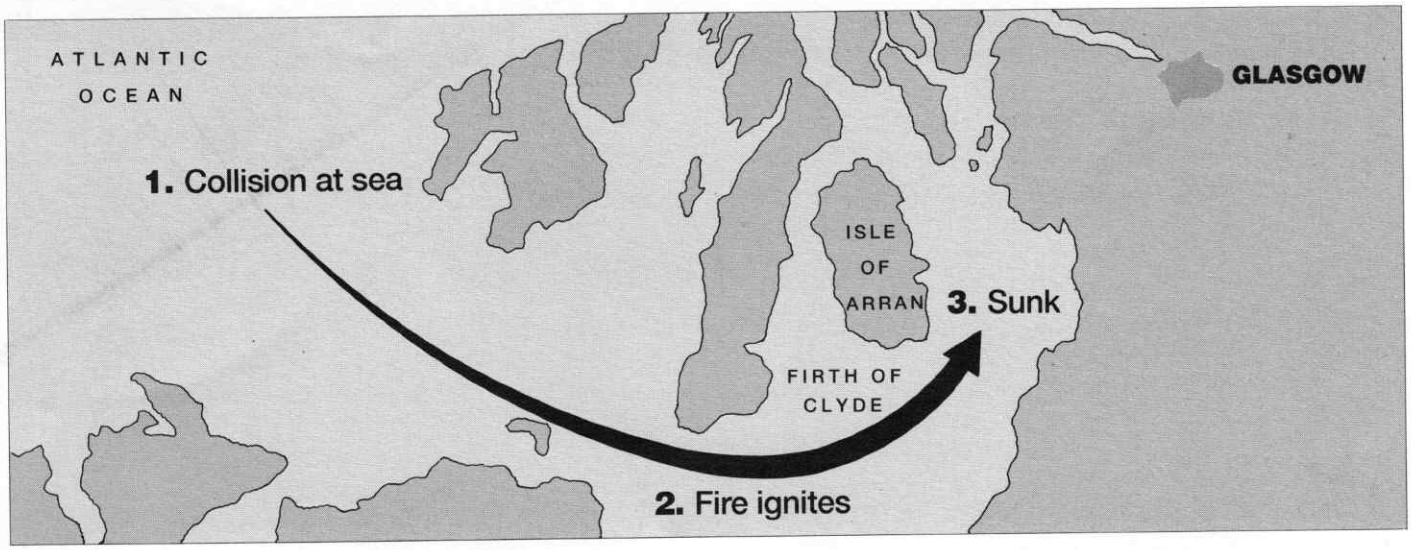
What occurred next is not clear. About 20 minutes after the crew had evacuated, an abrupt rise in radiation was detected by a helicopter hovering overhead. Soon after this a rumbled explosion was heard from within the submarine and immediately a section of the hull tore open just plume of radioactive debris headed skywards.

There has been a history of concern over the nuclear reactor fitted to Polaris submarines. Hair-line cracks have been found in sister submarines in a bimetallic weld near to the reactor itself, in part of the primary cooling circuit. Inspections carried out by the Warships Safety Committee had declared this submarine safe.

Thousands of residents have been evacuated from nearby areas. Scenes on the Isle of Arran were reminiscent of the retreat from Dunkirk as scores of small craft ferried locals to the mainland.

The island is said to have "died overnight".

The full scale of the impact of this tragic accident is only now becoming evident. Thousands of gallons of milk have been poured away. A total ban on fishing off the coast around the accident site has been ordered until further notice. Local water supplies are being closely monitored for signs of contamination as bore holes are dug to provide vital supplies of uncontaminated drinking water.



The Diary of a Disaster

1 July Polaris submarine returns from extended patrol lasting twice normal length due to non availability of relief submarine.

7 July After six day turnaround for crew change and new supplies, submarine returns on patrol for unknown duration.

Some time in last week of August....

Polaris submarine is accidently hit by Soviet "attack" submarine. Soviet submarine sustains serious damage to outer hull but is able to make a fast retreat pursued by British "attack" submarine. Polaris submarine sustains damage to propeller, steering and condenser outlets.

Polaris submarine signals to the Comander in Chief of the Royal Navy (CinCFLEET) at the Northwood HQ on the outskirts of London, with damage report and requests permission to return home for repairs.

CinCFLEET recalls Polaris submarine from patrol. Submarine is ordered to remain dived for as long as possible.

1 September

0500 Submarine enters Firth of Clyde on final leg of journey home.

0549 Hydraulic burst reported aft.

0550 Fire reported in machinery space.

0553 Crew to Emergency Stations.

0615 Loss of steering and depth control.

0618 Emergency surface ordered.

0625 Loss of essential electrical supplies.

0628 Reactor reported scrammed.

0632 Submarine breaks surface.

0635 Engineer reports serious problems controlling reactor.

0640 Abandon ship ordered.

0715 First explosion - internal bulk-heads rupture.

0735 Second explosion tears open section of hull aft of conning tower - plume of radioactivity soars into sky.

0750 Submarine sinks.

0859 Airborne radiation monitored on Isle of Arran.

0930 Civil defence emergency plans activated.

0935 Newsflash radio and television.

1000 Radiation levels monitored in Glasgow as cloud is blown east by inshore breeze.

1030 Local population within 30 km advised to stay in doors with windows and doors shut and sealed.

2 September

0930 Evacuation of Isle of Arran commences.

1125 Government officially declares local State of Emergency, Government Technical Advisor appointed, Ministry of Agriculture, Food and Fisheries (MAFF) impliments hitherto unpub-lished emergency plans for the region.

Expert sources close to the Ministry of Defence believe that a crucial M6 main steam isolating valve in the reactor compartment failed to operate. This caused rapid cooling and failure of the port steam generator. A cold slug of top up water was introduced into the primary circuit causing a catastrophic loss of temperature in the reactor core. This promoted a huge increase in reactivity and failure of the main coolant circuit. Primary coolant water burst from its metal piping and instantly flashed into steam. The resultant pressure release was too much for the internal structure of the submarine. Bulkheads crumbled releasing radioactive debris throughout the whole of the boat. The hull seals blew out as a second explosion tore open the boat's hull and it now began to ship water at an enormous rate. Within minutes of the first explosion the submarine was lying at the bottom of the Clyde. In the sky above rose a plume of radioactivity.

These newspaper reports are fiction but the overall accident presented here is compiled from a number of individual submarine and reactor incidents that have actually happened.

The collision is based very closely on an actual submarine incident which was not officially reported, exact details have been changed. Another similar accident was recently revealed by US crewmembers. It took place in June 1970 when a nuclear powered Soviet submarine sunk after a collision with a US "attack" submarine USS Tautog in the north Pacific. The collision occured when the Soviet submarine's underside slammed into the top of the Tautog's tail, and its propellers ground through the side of the conning tower.

The fire is based on an accident which took place on 7 April 1989, and resulted in the sinking of a Soviet Mike Class nuclear powered submarine 300 miles off the coast of Norway. The fire could not be contained. Forty-two crew members were killed. Also lost were the submarines nuclear reactor and two nuclear-armed torpedoes.

The reactor incident has not yet happened, although on January 26th 1988 the Polaris submarine HMS Resolution did suffer an electrical malfunction while docked at Faslane. Reports in the Observer newspaper at the time claimed that the malfunction shut down the primary coolant pumps, almost leading to a core meltdown.

This paper is designed to draw to your attention the alarming number of accidents involving nuclear powered vessels which have been reported; it lists some of the little known effects of a real nuclear accident which took place five years ago in Chernobyl; and paints a picture of the current operational state of Britain's Polaris submarines.

Finally the report leaves you with some open questions which you may wish to consider.

THE INDEPENDENT

Defects hit Nuclear Fleet

Polaris faults put effective British deterrent at risk

The **Guardian**

Polaris faults scupper guarantee of keeping nuclear deterrent at sea

Only one of Britain's deterrent vessels can put to sea for the lengthy defensive patrols.

GUARDIAN 27.6.91

It is our policy to keep at least one Polaris submarine at sea at all times.

GOVERNMENT POLICY STATEMENT ON NUCLEAR DETERRENT

Cracks have appeared in a bimetallic welded joint in part of the primary coolant circuit.

INDEPENDENT 11.5.91

STATE OF POLARIS FLEET

Not Available For Patrol

HMS Renown : Started refit Oct 1987
Expected completion late 1992

HMS Repulse : Not sailed since June 1990

Overdue Refit

HMS Revenge : Due refit 1989
Cannot start until RENOWN complete

Due For Retirement

HMS Resolution : Carried out the bulk of the Polaris patrols at sea since January 1990. Has completed longest Polaris patrols ever recorded. Six day turnaround between patrols in July 1991. Due for retirement mid 1992.

DAMAGE REPORT

NUCLEAR POWERED SUBMARINE ACCIDENTS REPORTED
WORLD WIDE DURING FIRST THREE MONTHS 1989

3 Jan	**FIRE**	Atlantic
3 Jan	**COLLISION**	Firth of Clyde
7 Jan	**FIRE**	Pacific
10 Jan	**COLLISION**	Pacific
17 Jan	**COLLISION**	Norfolk, Virgina USA
21 Jan	**COLLISION**	Atlantic
3 Feb	**FIRE**	Pacific
24 Feb	**FIRE**	Atlantic
20 Mar	**FIRE**	Atlantic
29 Mar	**FIRE**	Atlantic
4 Apr	**COLLISION**	off coast of Denmark
7 Apr	**FIRE**	Atlantic
7 Apr	**SUNK**	off coast of Norway

* source Naval Safety 1989: The year of the accident, Neptune 4, Handler, Wickenheiser, Arkin.

DAMAGE REPORT

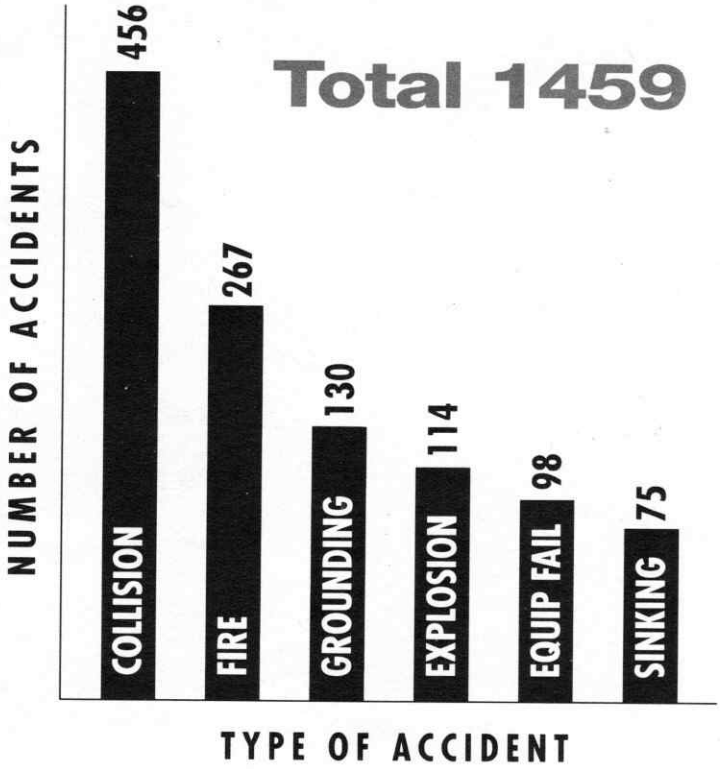
NUCLEAR REACTORS : 8

NUCLEAR WARHEADS : 50

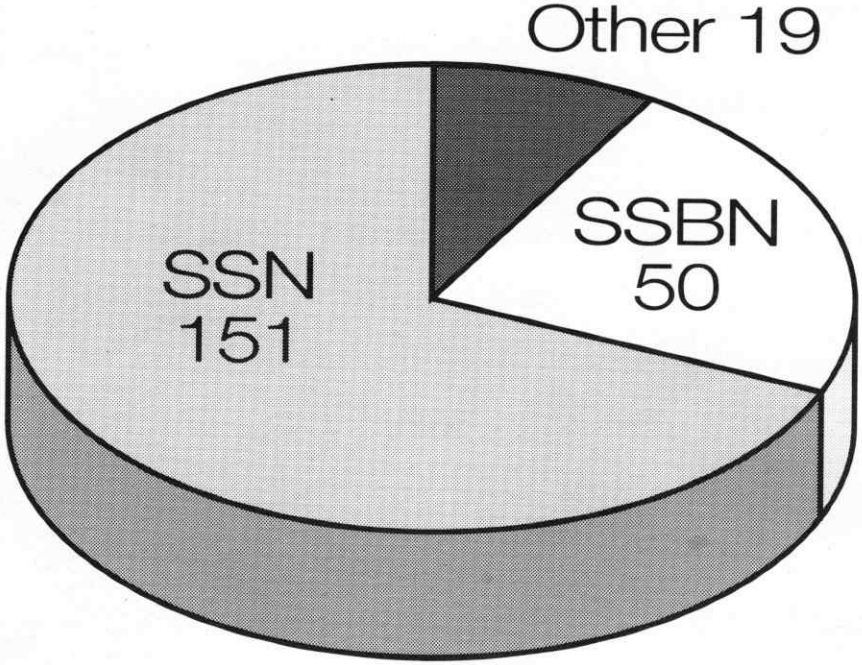
LOST AT SEA

Reported Naval Accidents (1945-1988)

Neptune Papers No 3



Accidents involving nuclear powered vessels



Total 220

SSBN
Nuclear Powered
Ballistic Missile
Submarine

SSN
Nuclear Powered
Attack Submarine

Don't let it

"Civilian reactors are encased in a thick concrete jacket which forms the secondary or final containment... the final containment in a naval reactor is the hull of the submarine which is made of steel and melts at quite a low temperature... its fuel is up to 20 times as radioactive... it is probably more dangerous if it comes to a catastrophic failure...."

Dr Peter Mason - Nuclear Physicist

TIME **01:23:40**

DATE **26th APRIL 1986**

PLACE **CHERNOBYL**

At 01:23:40 on 26 April 1986 part of the reactor of UNIT 4 at CHERNOBYL in the USSR suffered a 'prompt neutron power burst'.

"Within 4 seconds, UNIT 4 reached 100 times normal power. Some of the fuel disintegrated and evaporated the cooling water. This caused a steam explosion which blasted apart the 1000 tonne lid of UNIT 4. More water reacted with the core to generate hydrogen gas which detonated a second explosion hurling radioactive debris and radionuclides a mile into the sky"

"Half the fall-out from Chernobyl fell within a 35 km radius. The other half fell on more than 20 countries world-wide. Radioactivity was detected as far away as the Arabian Peninsular and North America."

happen again

Up to 40,000 people worldwide may die from cancer because of the Chernobyl disaster...10,000 people have died already ...It is not until 10 years after exposure to radiation that solid tumors start to turn up...

Guardian 19.4.91

Figure of 280,000 deaths world-wide calculated by nuclear physicist Richard Webb.

Ecologist Vol 16/4

Figure of 500,000 deaths world-wide calculated by Prof J Goffman.

International Herald Tribune 11.9.86

Chernobyl released into the biosphere 300-400 times the amount of long lived radionuclides released at Hiroshima.

L.M. Khitrov - USSR Academy of Science

The release accounts for only 3.5% of the total core inventory... 28,000 sq km in which 830,000 people live is contaminated to a level of 5 Ci/sq km at which people have to be continuously monitored... Within this, there are 10,000 sq km with a population of 250,000 where contamination is five times this level.

Chernobyl Five Years After - Belayer, Borovoi, Volko

In the UK 757 farms covering 400,000 acres are still subject to restrictions on the sale and movement of sheep.

Observer 29.4.90

Almost half a million mothers and children were evacuated from Soviet cities during the summer of 1986.

The Chernobyl Disaster - Haynes, Bojcun

The economic impact is between 283 and 358 billion dollars. This far exceeds the cost of the Armenian earthquake...The Soviet Union would have been financially better off never to have developed nuclear energy.

Words of wisdom?

" The probability of a major nuclear accident is between 1 in 10,000 and 1 in 1,000 million per year per reactor"

WASH 740 REPORT 1957

CLYDE AREA PUBLIC SAFETY SCHEME (CLYDEPUBSAFE) explains that:

"It is unlikely that a health hazard would exist beyond 550 metres from the vessel in the event of a major reactor incident at Faslane"

"The contamination is unlikely to build up to significant proportions during the first few hours after the accident"

"Only in the worst kind of incident should it be necessary to alert members of the public living nearby"

"550 Metres is the distance in which certain automatic precautions are taken..." "...in the case of a contained accident we don't expect it to get anywhere as far out as 550 metres"

V.H.B Macklin - NUCLEAR WARSHIPS COMMITTEE

"There is an obsession for security aspects to the level where it might endanger public safety"

John McVicar - STRATHCLYDE EMERGENCY PLANNING OFFICER

"The British are much more reluctant to admit to the people, and are more cavalier to the dangers of radioactivity than we are in the United States."

Capt. James Bush - Ex US Submarine Commander based Holy Loch on the Clyde

Open Questions

ON SAFETY LIMITS

Civilian nuclear operators have been required to revise their emergency plans following Chernobyl.

What revisions have been undertaken by the Ministry of Defence for nuclear powered submarines?

ON SAFETY FACTORS AND POLARIS

Polaris submarines have the same nuclear reactor system as the Valiant and Churchill class, which have been withdrawn from patrol since the discovery of reactor defects on sister submarines.

Is the Ministry of Defence operating dual safety standards to maintain their nuclear deterrent policy of keeping one Polaris carrying submarine at sea?

ON EMERGENCY PLANS

The Ministry of Defences' immediate evacuation zone in the event of a nuclear incident was set in the 1960s. A greater understanding of the hazards of nuclear power over the last 30 years means that this policy is clearly outdated.

What steps are the Ministry of Defence taking to put together realistic public safety schemes for their nuclear submarine berths?

ON POLARIS

Polaris submarines are now a major threat to the people they were supposedly designed to protect. The submariners who work on them, the civillian works at Faslane and Rosyth and the people who live near to these bases.

The cold war is over.

Isn't it time to Bring Polaris Home ?

Sources

* **Naval Accidents 1945-1988** **Neptune Paper 3**
William Arkin & Josh Handler. Published June 1989

* **Naval Safety 1989: The Year of The Accident** **Neptune Paper 4**
Josh Handler, Amy Wickenheiser and William Arkin. Published April 1990.

* **The Sinking of the Soviet Mike Class Nuclear Powered Submarine**
Report by Large and Associates. Published April 1989

* **The Greenpeace book of the Nuclear Age**

* **Bring Polaris Home**
Report by Greenpeace. Published May 1991

The Independent 11 May 1991

The Sunday Times 18 March 1990

The Guardian 27 June 1991

* **Reactor System Defects in Royal Navy Nuclear Powered Submarines**
Report by Large and Associates - 4 December 1990

Scottish TV - Scottish Eye - Documentary: The Base Line

Publications marked * may be purchased from Greenpeace.

Details and all general information enquiries should be addressed to:

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