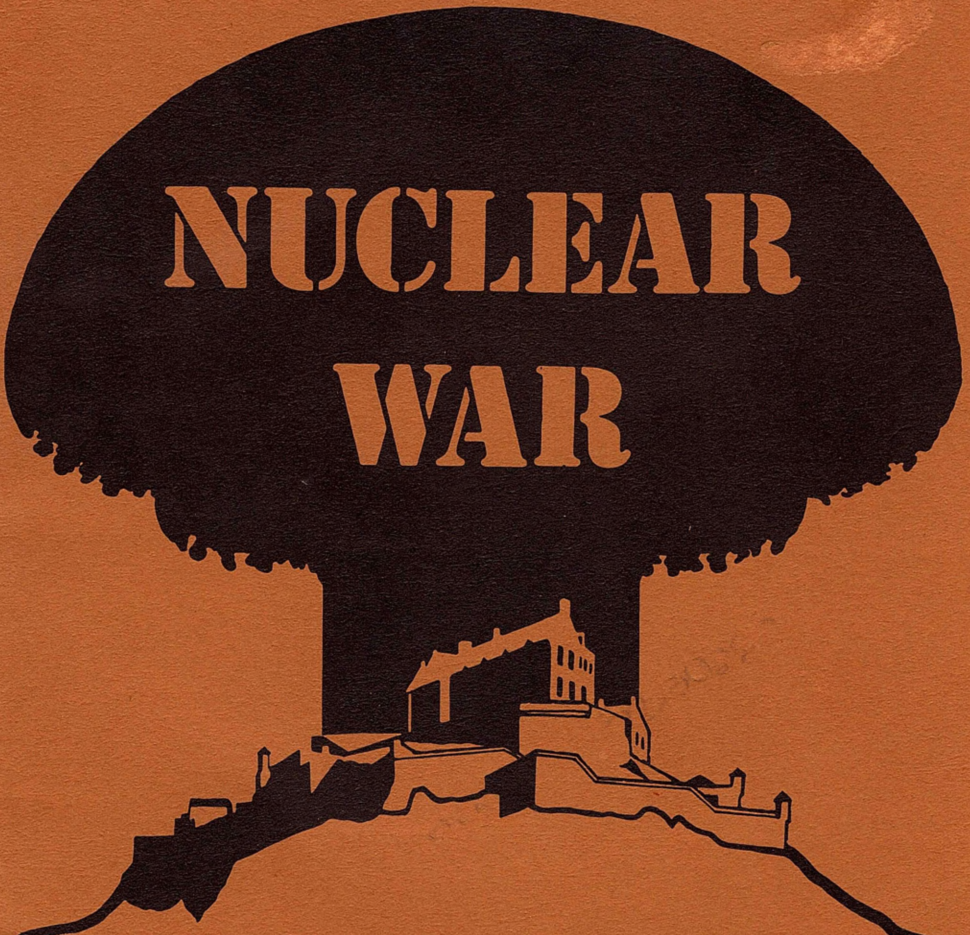
NUCLEAR WAR



'prevention is better.......'

a statement by
members of the medical profession

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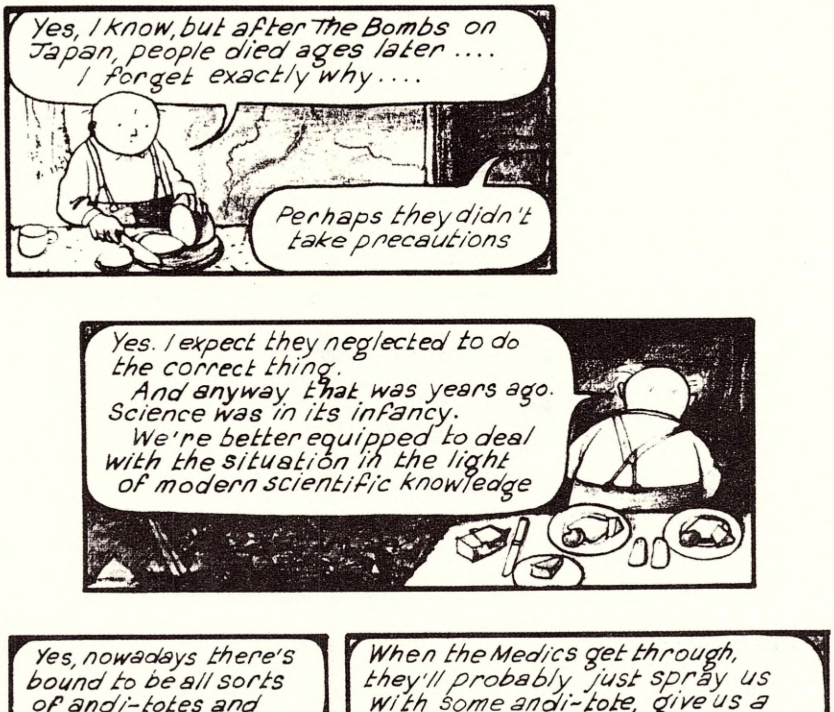

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HIROSHIMA

In July, 1945 the first test atomic bomb was exploded in the New Mexico Desert, USA. Three weeks later, at 8.15 a.m. on Monday 6th August, a Uranium 235 bomb exploded 550 metres above Hiroshima. This bomb had a yield of between 12.5 and 20 kilotons (0.0125 and 0.020 megatons). Earlier that morning an air raid warning had sounded but at 8 a.m. the 'all clear' was given. The inhabitants went about their business and didn't worry when they heard the drone of a single B29 bomber far up in the sky. Suddenly there was a flash that felt as "a sheet of sun". Within seconds a rapidly expanding fireball developed into the now familiar mushroom cloud. Mica with a melting point of 900°C, fused on granite gravestones, and gray claytiles, melting point 1300°C melted 600 yards from the explosion. The subsequent firestorm, fanned by winds 50-60 km/hr rushing towards the centre of the devastated city lasted for 6 hours and razed an area of 12 sq. km. 60,000 houses were destroyed out of a total of 90,000, a further 6,000 were damaged beyond repair. There was an occasional dark human silhouette outlined against bleached walls. The central area closest to the explosion had become a complete shambles of rubble and twisted metal. Further out the scene was different; "the streets were littered with a macabre traffic – hundred of crumpled bicycles lying among shells of street cars and automobiles".[1]

Scenes from Armageddon

So, within a few short hours Hiroshima had been devastated. Of a population of 245,000, 78,000 were dead and a further 84,000 injured. No one could understand what had happened. Thousands of hurt and maimed people began to flee from the city. Hair and eyebrows were burned off; skin hung in sheets from faces and hands. Some were vomiting. "Almost all had heads bowed, looked straight ahead, were silent and showed no expression whatsoever". "In general, survivors that day assisted only their relatives or immediate neighbours, for they could not comprehend or tolerate a wider circle of misery". "From every second or third house came the voices of people buried or abandoned who invariably screamed......".[1]

Towards evening the streets became quieter. "Now not many people walked in the streets, but a great number sat and lay on the pavement, vomited, waited for death and died". Even now, there was no organised help and the massive death toll continued to mount. "They all felt terribly thirsty and they drank from the river. At once they were nauseated and began vomiting, and they retched the whole day". The few that were capable of helping others had a gruesome time. When Mr. Tanimoto arrived at Asano Park "it was very crowded, and to distinguish the living from the dead was not easy, for most of the people lay still with their eyes open". ".... the hurt ones were quiet; no-one wept, much less screamed in pain; no-one complained; ....not even the children cried; very few people even spoke. And when Father

Kleinsorge gave water to some whose faces had almost been blotted out by flash burns, they took their share, and raised themselves a little and bowed to him, in thanks". Continuing fires whipped up by the wind forced vast crowds towards one of the rivers. Those near the bank were pushed in – and drowned.

Later on abnormally large drops of water, the size of marbles, began to fall. A rumour spread that the Americans were dropping Gasoline and were going to set fire to it. As if the desperate had not already had enough, a whirlwind ripped through the park and large trees crashed down. Survivors that evening noted that the asphalt on the streets was still too hot to walk on with comfort. Two men noticed "a pumpkin was roasted on the vine." It was eaten and it tasted good. Potatoes under the ground were nicely baked and were gathered for food. Many desperately ill survivors found their way to the sand pits on the river deltas. The tide was coming in. Many were too weak to move themselves but were helped by exhausted survivors. "He reached down and took a woman by the hands, but her skin slipped off in large glove-like pieces." Others were moved up the sand pit but the following morning it was noted that they were gone; the tide had come higher than expected".[1]

During this first terrible day in Hiroshima, Father Kleinsorge was asked to help some soldiers. "When he had penetrated the bushes, he saw there were about 20 men and they were all in exactly the same nightmareish state; their faces were wholly burned, their eye sockets were hollow, the fluid from their melted eyes had run down their cheeks." Such is the fate of those with faces upturned when an atomic bomb goes off.

Medical Consequences

The doctors involved with the casualties in both Hiroshima and Nagasaki had to work in quite appalling conditions, with an unbelievable work-load dealing with a "disease" new to mankind. Many of the hospitals were partially or completely destroyed: out of 45 hospitals only 3 were unscathed[1] . Of the 150 doctors in Hiroshima, 65 were killed outright. Most of the rest were wounded. Of the 1780 nurses, 1654 were dead or too badly wounded to work. The Red Cross Hospital – the largest in the city and 1,650 yards from the centre of the explosion was badly damaged. Only 6 out of its 30 doctors were able to work and only 10 out of 200 nurses were able to continue with their duties. Doctors working in the Red Cross Hospital initially thought that there had been a direct hit; as the day wore on they could not understand why more and more casualties were coming in. "Before long patients lay around on the floors of the wards and the laboratories and all the other rooms, and in the corridors, and on the stairs, and in the front hall.....". Dr. Sasaki had not looked outside the hospital all day; the scene inside was so terrible and so compelling that it had not occurred to him to ask any questions about what had happened beyond the windows and doors. Ceilings and partitions had fallen; plaster, dust, blood and vomit were everywhere. Patients were dying by the hundreds, but there was nobody to carry away the corpses..... thousands of patients and hundreds of dead were in the yard and on the driveway."[1]

Approximately one third of an atomic bomb's energy goes into thermal radiation causing flash burns. Subsequent fires cause flame burns. At first the hospital doctors could not understand how so many not caught in house fires received such terrible burns. Thousands of Hiroshima burns victims were inadequately treated or not at all. It has been estimated that about 25% of deaths occurred from burns; 50% from other injuries and 25% from radiation effects[1]. Fairly early on doctors and survivors began to realise something odd was going on. Many people without apparently severe burns or injuries began to collapse and die. This was, of course, the now well documented *"Radiation Sickness"*. The bomb being exploded high above the city caused significant direct radiation. There was however little of the longer lasting and potentially more lethal fall-out radiation. The doctors involved with casualties subsequently recognised three stages in the radiation effects:–

1. Most of these casualties never received any form of treatment. These immediate radiation effects were caused mainly by neutrons, (and also Beta particles and Gamma rays). They were the cause of the apparently uninjured dying within hours of the explosion. 95% of those within half a mile from the centre of the explosion died. Those that did not die early subsequently developed nausea, headaches, diarrhoea, malaise and fever which lasted several days[1].

2. At about two weeks, casualties suffered from hair loss and a recurrence of diarrhoea and fever. At 3-4 weeks blood disorders became manifest in the form of bleeding gums, petechiae, (small purple spots on the skin) and anaemia. These were invariably associated with a low white blood count. A high steady fever was a poor prognostic sign as was a white blood count below 1,000/mm[1]

3. The final stage was one essentially of recovery in which the white blood count gradually increased. Often, however, complications set in such as chest infections. some recovered within weeks; others took months[1].

Although the disease was essentially new there was some experience in treating patients who had suffered excessive x-ray radiation so these atomic bomb radiated victims were given liver extract, blood transfusions, and vitamins – especially Vitamin B. It was noted that those with severe flash burns were to some extent protected against the effects of radiation. Those who had exerted themselves little after the explosion also fared better. There was considerable anxiety amongst doctors in treating such patients. They behaved peculiarly. Father Kleinsorge was referred to a hospital in Tokyo with a message:– "Think twice before you give this man blood transfusions, because with atomic bomb patients we aren't at all sure that if you stick needles in them, they'll stop bleeding"[1].

There were longer term effects. Leukaemia showed a significant increase in the survivors. It would seem that there is a much higher risk of developing leukaemia in those patients who have had whole body (bone marrow) radiation; most of the Japanese survivors came into this category. Approximately 40,000 persons entered Hiroshima after the explosion to help in rescue work. Those that entered within the first three days were exposed to significant short-lived neutron radiation; and this group were found to have a high subsequent leukaemia rate.[2]. The incidence of thyroid, breast and lung cancers in the Japanese survivors was significantly increased. Early reports seemed to indicate an increase in male sterility and female miscarriages. There were also reports of an increase of babies born with abnormally small heads. However, the detailed long-term radiation studies suggest that as yet there are no detectable genetic effects and there has been no rise in the malignancy rate amongst those in-utero at the time of the explosion; and that there has been a decrease in the overall mortality of survivors and not the suspected increase.[2]

Other Consequences

The immediate physical effects were fire and collapse and destruction of buildings. the central area of Hiroshima became an inferno into which no fire-fighting force could enter; streets and access routes were full of debris. 70% of the cities fire-fighting equipment was destroyed and 80% of the firemen did not report to their posts.[3] There was a drastic shortage of basic supplies including medical equipment, beds or mats for patients, food, safe drinking water and reasonable shelters for those who survived. Normal public health measures were not immediately available. Thousands of dead bodies had to be disposed of and initially there were inadequate resources for this.[3] Power supplies and electric systems were shattered.

As described, the normal pattern of hospital care was entirely disrupted. However, surrounding areas and communites had not been affected and were able to help fairly quickly.*

Many survivors had resigned themselves to devastation caused by the bomb; however, when the long term effects of radiation became known they developed a great hatred for those responsible. Later Dr. Sasaki was to say:– "I see that they are holding a trial for war criminals in Tokyo just now. I think they ought to try the men who decided to use the bomb and they should hang them all".[1]

Since then the citizens of Hiroshima and Nagasaki have "risen above grief and hate to a belief in mankind's essential unity, and with one voice they proclaim 'no more Hiroshima's, no more Nagasaki's'; and in order that man will never repeat these disasters, they have called for the elimination of nuclear weapons from the face of the earth."[4]

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THE CASE FOR PREVENTIVE MEDICINE

There has been no major global conflict for 35 years and many would argue that the nuclear balance of terror has been the price of peace. Others, including ourselves, would say that this is a delusion and that our situation is akin to that of the man who leapt from the skyscraper roof and was heard to mutter as he passed the twentieth floor 'so far so good'! The grounds for such pessimism are based on the evidence that:

1. The concept of deterrence is no longer viable.

2. Deterrence has been replaced by an aggressive 'counter-force' whose ultimate aim is to obliterate enemy military installations and weaponry in a pre-emptive 'first strike'.

3. We are rapidly approaching the situation where first strike capability is a reality.

4. The credibility of the new strategy requires almost total dependence on computerised early warning systems linked to automatic 'launch on warning' in the event of an attack – a situation which leaves no room for error.

The motive force behind these changes in strategy is the rapid advance in military technical sophistication which has created conditions of military instability and which is more likely to precipitate an all-out nuclear war than the presumed aggressive intentions of either Russian or American leaders.

(1) Deterrence

Why is deterrence no longer viable? A deterrence policy is based on the ability to cause unacceptable damage to a potential aggressor – and make him think twice before attacking. For example, to deter the Russians about 600 nuclear weapons, aimed at their 200 major cities, would be required. In 1979 the U.S.A. had around 13,000 strategic nuclear weapons, somewhat in excess of deterrence requirements!! The Russians similarly have many more weapons than required for simple deterrence.

(2) Counterforce Strategy

The purpose of this extra weaponry is to destroy the enemy's military installations, missile silos and strategic economic targets, ideally in a single, all-out, pre-emptive first strike. This policy, which is known as 'counter-force' strategy was introduced in 1974 by J.R. Schlesinger, the then Secretary of Defence. It was then enshrined in 1980 by President Carter in Presidential Directive 59 (PD59.). This excess of weaponry is of course not the only evidence of the counter-force strategy. For example, the destruction of missile silos requires greatly increased accuracy and much of the technical effort of the last decade has been to this end. Thus the accuracy of cruise missiles is of the order of about 100 feet, or 30-40 metres. Such accuracy is irrelevant for a deterrent policy in which missiles are aimed at whole cities.

(3) First Strike

The logical extension of a counter-force strategy is inevitably the attainment of first strike capability. There is no point in blowing up a silo if the ICBM (Inter-Continential Ballistic Missile) is already on its way, and for counter-force to be meaningful it has to be capable of delivering a single catastrophic blow to the enemy, to which he is unable to respond. The U.S. and U.S.S.R. are engaged in a race to attain this capability – with the deployment of cruise, Pershing II and Trident, the Americans may well have achieved it. The evidence also suggests that the Russians may collapse economically in the effort to keep up. To appreciate the significance of the advances being made towards first strike capability we need to look briefly at the weapons available, their size, accuracy and detectability.

The success of counter-force depends on the ability to destroy an ICBM in its silo, which in turn depends on:

a. The power of the missile.
b. The accuracy of the missile.
c. The 'hardness' of the target (or maximum force the silo can withstand).

The combined measure of power and accuracy is known as lethality which depends much more on accuracy than explosive power. Thus if *explosive power* is increased tenfold, lethality only increases by 5 times, but if *accuracy* is increased tenfold, lethality increases by a hundred times. Therefore counter-force capacity depends primarily on achieving accuracy.

The lethality required to destroy a silo of given 'hardness' i.e. the overpressure the silo can withstand in lbs/sq. inch, is expressed by *'kill probability'*: – 97% kill proability being taken as virtually certain destruction. It is therefore possible to compare the counter-force capability of the U.S.A. and the U.S.S.R. by calculating the lethality of their warheads and the number of hardness of their silos for 1979.

	Lethality of warheads i.e. power & accuracy	**Lethality required to achieve 97% probability of target silo destruction**	**Ability to destroy enemies weaponry % capability**
USA	29,000	50,000	58%
USSR	42,000	120,000	35%

As can be seen from the above table the U.S.A. have almost an estimated two-fold advantage over the U.S.S.R. in counter-force capability. We can now use this kind of data to appreciate the projected escalation of counter-force weaponry in the 1980s. Four programmes are under way in the U.S.. Much less is known about Russian military programmes than that of the U.S.A., but they are known to be engaged in deploying SS20 missiles with independently targetable warheads. These weapons are no direct threat to the U.S.A. since they are essentially medium range "theatre weapons" and could only be used against European targets. A silo hardening programme is also under way.

In the U.S.A. there are at least four well publicised programmes in operation:

		Additional Lethality
(1)	MIRV warheads on Minuteman III	59,000
(2)	Poseidon C3 conversion to C4	19,000
(3)	Deployment of 144 Trident D5 missiles	20,000
(4)	Cruise – the arming of 100 B52G bombers each with 20 long range cruise missiles which have a lethality of 1300/missile	2,600,00

The deployment of cruise therefore increases the total lethality of the American nuclear stockpile one hundred-fold giving total lethality for all forces of around 2.72 million, i.e. this would be the largest step ever in the arms race. The reason for the lethality of cruise are its incredible accuracy (less than 30 metres – 100 feet), giving almost 100% kill probability even against super-hardened silos, and its virtual immunity from detection. The deployment of cruise dwarfs all other advances into insignificance and is final confirmation, if any were needed, of counter-force strategy and the race towards first strike capability.

Absolute first strike capability requires that all the enemy's weaponry is vulnerable. The Russians have one last 'deterrent" card – their nuclear submarines – but even these which were previously considered invulnerable are now much less so, if at all. The reason for this is primarily that big advances in electronics have provided monitoring and detection systems which make deep sea submarines easier to locate and render their communication systems vulnerable to interference.

(4) Launch on Warning

Finally, the credibility of *counter-force* philosophy also depends on being seen to be able to respond within a few minutes of an attack. This has led to a very high degree of dependence on automatic computerised missile launching systems and a policy of '*Launch on warning*'. Thus the possibility of technical failure resulting in false alarms and an accidental launch of nuclear missiles becomes ever more likely.

Although it seems improbable that the Americans or Russians would deliberately start a nuclear war. In 1978 US Chiefs of Staff informed Congress that there was a 50% chance of nuclear war taking place by 1985 and a 95% chance of nuclear war taking place by the year 1995.It is ironic therefore that the elaborate systems that have been constructed to defend the 'free world' and the 'Soviet Socialist Peoples' may soon precipitate the war they were designed to prevent. How we have arrived in this situation is open to conjecture. It may be partly as a result of economic interests of the arms industries and partly because scientists have failed to see that their technical innovations are actually fuelling the arms race.

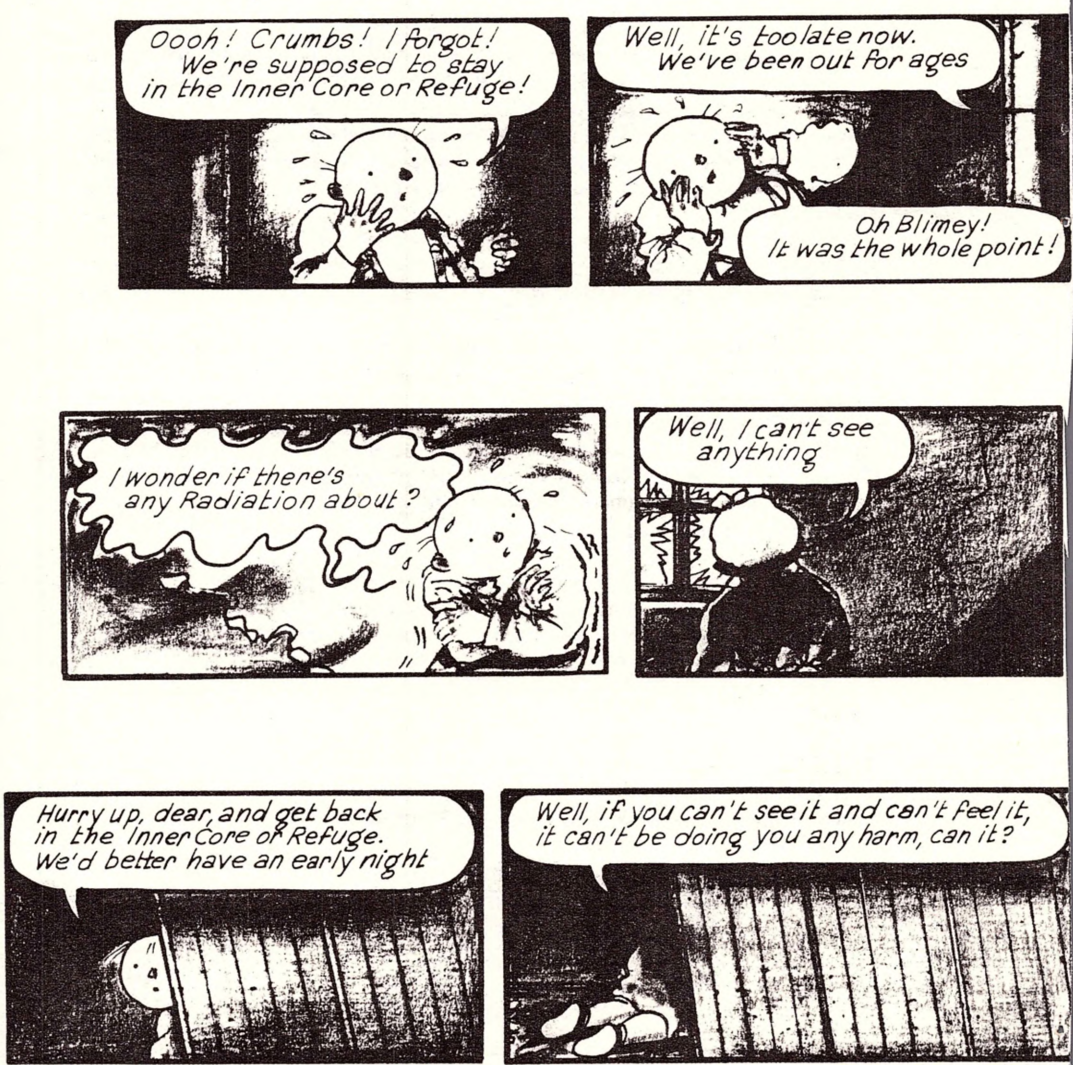
The realisation of the seeming inevitability of nuclear was and the potential cost in lives and property which might ensue has prompted medical workers of all political persuasions to examine the consequences of modern nuclear warfare. This awareness has also timulated the formation of medical groups in the U.K. (Medical Campaign Against Nuclear Weapons), the U.S.A. (Physicians for Social Responsibility) and many other countries, whose members view the nuclear threat as the greatest potential catastrophe mankind has ever faced.

Until the public realise that these issues cross all party political boundaries and that nuclear disarmament, although itself risky, is now our only hope of avoiding the holocaust, we will continue the inevitable march towards nuclear war.

Source

SIPRI Yearbook 1981

Towards the final Abyss? Professor M. Pentz



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SHORT AND LONG TERM MEDICAL ASPECTS OF NUCLEAR WAR

We must be in no doubt that the management of casualties resulting from even a limited nuclear attack would be completely beyond the capacity of existing fully operational medical facilities. The serious long term effects of radiation such as an increased risk of many forms of cancer pale into insignificance when compared with the vast number of deaths and casualties from burns, blast injuries and radiation.

This pessimistic view is based on analysis of death and casualty rates by the United Nations,[5] U.S. Department of Defense,[6] Office of Technology Assessment[7] and the Home Office.[8]

In a study performed by The Office of Technology Assessment for the U.S. Foreign Relations Committee in 1980 the most conservative estimate assuming that 90% of the U.S. population were in the available Civil Defence shelters would give an immediate fatality rate of 35% However this fatality rate in the same study rose as high as 77% if less warning was assumed and the population was consequently less well prepared or protected.[5]

Burns – Trauma – Radiation

Burns

Burns of more than 12% of the body surface area of a child or 18% of the surface area of an adult cause so much fluid and protein to be lost from the damaged area that intravenous transfusion of fluid is required to avoid fatal shock. When a patient develops shock the body compensates initially by severely restricting the blood supply to "non-vital" organs (e.g. skin and gut) but without proper therapy, damage also soon occurs to "vital organs" such as kidneys, heart and brain; this inevitably leads to death.

Patients suffering from severe burns require a high standard of care if they are to survive. In hospital they would be given sedation, pain relief, plasma and fluid replacements, large quantities of protein to stimulate healing and replace losses, oxygen is often required and antibiotics are employed if infection develops. Facilities for the treatment of 30 such patients exist in the Edinburgh area. An explosion of a one megaton nuclear device over Edinburgh would produce at least 45,000 patients requiring urgent medical treatment for burns alone.

Trauma from the effects of blast

While the human body can withstand blast pressures which would cause severe damage to the strongest buildings, it is very vulnerable to the indirect effects of blast.

THE CONSEQUENCES OF AN ALL-OUT NUCLEAR ATTACK ON SCOTLAND

The account which follows is an analysis of the simulated nuclear attach on Scotland envisaged during the civil defence 'Square Leg' exercise (Sept. 1980).

How nuclear was would break out is open to conjecture but it could result either from escalation of a conventional war between NATO allies and Warsaw Pact, from proliferation of nuclear weapons to yet more countries movitated by fear of their neighbours, accidentally as a result of communications or computer failure, or from a pre-emptive strike by either of the super powers.

In an escalating conflict we would have prior warning of an attack permitting civil defence preparations to be made. Our evidence suggests that such measures would be of no benefit to the civilian population living within a wide area around any target zone. There is also no possiblity of escaping potential target zones as it is a matter of government policy that movement of civilian population would not be allowed and cities would be sealed off as part of the preparation for a nuclear attack.[11,12]

Accidental launch of nuclear missiles as a result of human or computer error are a real possibility. In the US nuclear forces (total 150,000 men), 5,000 per year are withdrawn from their duties because of problems related to psychological stress or drug abuse; similar problems are known to affect Soviet troops[13]. The potential for human error is thus great. Computer errors occur in the Pentagon complex every 35 minutes[13] and in recent months false alarms have resulted in two major nuclear attack alerts. Since the decision to respond must be made within minutes the chances of accidentally precipitating a nuclear exchange are very high. In this instance we would have no warning of attack and missiles would reach targets within minutes of launching.

The third possibility, a pre-emptive strike by the super powers is seen as a real possibility by the government and formed the basic premise of the recent Civil Defence operation 'Square Leg' (Sept. 1980)[15]. This exercise assumed that we would have nine minutes warning of an attack taking place and that it would be complete within four hours.

The Scottish targets designated for this exercise are shown in Table 1 (see page 19) and include most military and major industrial targets. All the weapons used were in the one megaton range with the exception of a five megaton bomb directed against the Polaris base at Faslane. Nine of the detonations were air bursts, two water bursts and twelve ground bursts; the area affected by blast and fire damage following an air burst is 30% greater than by ground bursts but local fall out is very much less[8]. Using data published by the Home Office/SHHD([8], UN[5] and US Depts. of Defense and Energy[6] we have analysed the likely effects of this nuclear attack on both the physical environment and the local population.

Blast Damage: (See Figure 1, page 20)

In the central belt of Scotland there would be damage ranging from complete destructin to moderate or severe damage to about 80% of buildings over an area of 1470 sq. miles. This would include the cities of Edinburgh, Glasgow, and Dundee and almost all the towns on the Clyde, Forth and Tay esturies. Aberdeen, Ayr, Peterhead, Lossiemouth/Elgin, Inverness and Thurso would have be very severly affected.

Light damage sufficient to shatter windows, blow in doors and remove roof tiles would be done to property over an area of 2,900 sq. miles and significantly reduce protection against radiation from subsequent fall-out.

Flood Damage

The extent of flood damage following the two 1 megaton water bursts in the Clyde Estuary is difficult to estimate. However, some idea of the size of the tidal wave and water displacement can be gauged from the results of the Baker test explosion in Bikini in 1946. In this test a twenty kiloton bomb (i.e. 0.02 megatons) displaced one million tons of water and produced a primary tidal wave which was 94 feet high 1000 feet away from the explosion. At 4 miles from the explosion the ninth wave was still 6 feet high. The two one megaton explosions each 50 times more powerful than the Bikini weapon in the relatively confined space of the Clyde estuary would produce a very much greater tidal wave whose height would bvve augmented by a "bore effect" as the waves moved upstream.

Fire Damage: (Figure 1)

The zones of spontaneous combustion and firing of buildings due to direct heat from the explosion, in conditions of good visibility, are similar in extent to the effects of blast. However, other fires will occur outside these areas either because of spontaneous firing or due to spread from the inner zones. The firing hazard within and outwith these zones would be compounded by the effect of non-synchronous detonations since the blast from proceding explosions would not only damage buildings but also expose them to the thermal effects of subsequent blasts. In the event of such multiple explosions the recommendations for protecting against thermal effects such as white-washing windows suggested in the Protect & Survive pamphlet (HMSO 1980) would be useless.

Radiation Effects: (See Figure 1, page 20)

The initial ionising radiation from a nuclear explosion constitutes about 5%

of the total energy produced and only affects a small area of about 3 sq. miles in the case of a 1 megaton explosion. Blast and thermal effects are so devastating in this zone that ionising radiation makes an insignificant contribution. However, nuclear fall-out which is distributed over a wide area exposes a large population to radiation hazards and makes a significant contribution to casualty rates. (See Appendix).

We have calculated the areas likely to be affected by dangerous radiation doses in the immediate post attack period. The largest zone (Figure 1) would receive dose rates of 300 rads/hour within 2 hours of the detonation. Within this zone there would be a region of 860 sq. miles receiving 1000 rads/hour and an inner zone of 180 sq. miles receiveing 3000 rads/hour. These high dose areas would be down-wind of major fire and blast damage and would therefore cause further casualties. In considering the effects of radiation doses on the population, the "protective factor" of houses and shelter must be considered and allowance made for radioactive decay. In intact houses survivors in basements would receive 1/70th of the external radiation dose and those on ground floor shelters 1/10th of the external radiation dose. Thus in the 3000 rads/hour zone the basement dose would be 40 rads/hour and on the ground floor 300 rads/hour, while in the 100 rads/hour zone there would be 14 rads/hour to the basement and 100 rads/hour to ground floor occupants. A dose rate of 300 rads/hour after allowing for radioactive decay would result in 100% morality while 100 rads/hour would cause severe radiation sickness and some deaths.

However the area subjected to blast damage (Figure 1) is extensive and these protection factors would be reduced by the preceding blast damage to windows, doors and roofs.

Casualties: (See Table 2, page 21)

Some idea of the scales of the casualties can be obtained from the reports of the aftermath of the 20 kiloton explosion over Hiroshima. In the immediate post attack period one third of the population died, one third were seriously injured and in urgent need of medical attention and a further third were unscathed. All but one of the bombs expected to be dropped on Scotland are 50 times larger than the Hiroshima weapon and the bomb to be dropped on Faslane is 250 times larger.

The percentage of casualties for each of the areas under attack has been estimated both with regard to Hiroshima data, the site and nature of the explosions and the modifying influences of local landscape. These are shown in Table II.

Of the total population of nearly 3.5 million involved in or around target areas one million would be killed outright or die shortly after the attack; a further 1.5 million would be seriously injured by burns or trauma. In view of the USSR. We hope that at least some will enter the nuclear debate and ask polticians who represent them whether the potential risks have now become intolerable and it is time to find another way to maintain the balance of world peace.

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the inevitable absence of medical support this 1.5 million would rapidly swell to the overall casualty rate of around 2.5 million. Those who survived would be subjected to lethal doses of fall-out and less than 10% of the population of Central Scotland would be expected to survive. These casualty rates are comparable with the civil defence estimates of 12 million short-term survivors out of the total U.K. population of 60 milion in a "worst case" attack.

For those who survive this holocaust a number of further hazards will be face.

(a) **Shelter:** An attack on Scotland during winter would have devastating consequences as not only would there be loss of shelter but also loss of normal power and fuel supplies. Such individuals as survived in target areas would be reduced to living in damaged buildings or makeshift shalters, scavenging for wood to burn as fuel.

(b) **Food Supplies:** These would be disrupted both in the short and long term. Central food stores would have been destroyed and food processing plants would be lost or unuseable because of lack of power. Damage to crops and loss of livestock would cause severe world-wide shortages for a considerable period of time.

(c) **Water Supplies:** These would also be disrupted to a variable extend depending on local damage to dams, pumping stations and distribution networks.

(d) **Medical Support:** It is futile to expect that any significant degree of medical support will be available. Virtually all acute hospital beds lie within major damage zones and there will be high casualty rates among doctors and nurses just as in the rest of the population.

(e) **Public Health:** Several major public health hazards are inevitably. The first is that there would be a huge number of unburied corpses which would be difficult to dispose of. Rotting bodies attract vermin and flies and would encourage the spread of disease. The second is the problem of maintaining clean water supplies and it is likely that typhoid, polio and hepatitis would re-emerge as major problems. Psychological disturbance amongst survivors should also be expected and is a well recognised reaction to major disasters of all kinds. Panic reaction and frantic searching for family members and agressive uncontrolled responses can be expected and would lead to confrontation with forces of Law and order if they exist in the post attack situation. Later with a realisation of the extent of the destruction, widespread apathy would ensure and compound the practical difficulties faced by survivors.

The reaction of many readers to this analysis will be to say that this holocaust may never happen or that by disarming we may actually provoke an attack by

Table 1

TARGET	TYPE OF TARGET	WEAPON
GROUP A	1^{o} MILITARY (2^{o} Damage to Civilian and Industrial Targets)	
1 **Holy Loch**	U.S. Poseidon Submarine Base	1Mt (G)
2 **Faslane (Garelochead)**	G.B. Polaris Submarine Base	5Mt (G)
3 **Coulport**	Underground Nuclear Missile Store	2 x 1Mt (G)
4 **Gareloch**	Block Submarine Exit	1Mt (W)
5 **Mid Clyde Estuary**	Flood Upper Clyde/Glasgow	1Mt (W)
6 **Machrihanish**	Airfield & Nuclear Weapon Store	2 x 1Mt (A & G)
7 **Prestwick**	Airfield	1Mt (A)
8 **Rosyth**	Navy Base (Nuclear Sub. Repair)	1Mt (G)
9 **Lossiemouth**	Airfield & Nuclear Weapon Store	1Mt (G)
10 **Buchan**	RAF Radar	2 x 1Mt (A & G)
11 **Leuchars**	Fighter Base	1Mt (G)
GROUP B	1^{o} CIVILIAN/INDUSTRIAL	
12 **Glasgow** - Bearsden		1Mt (G)
13 " Rutherglen		2 x 1Mt (A & G)
14 **Edinburgh** - Turnhouse		1Mt (A)
15 **Grangemouth - Kincardine**	Refinery, Power, Bridge	2 x 1Mt (A & G)
16 **Dundee**	Tay Bridge	1Mt (G)
17 **Aberdeen**		1Mt (A)
18 **Inverness**		1Mt (A)
19 **Dounreay**		1Mt (A)

G = Ground Burst Weapon W = Water Burst Weapon A = Air Burst Weapon

Figure 1

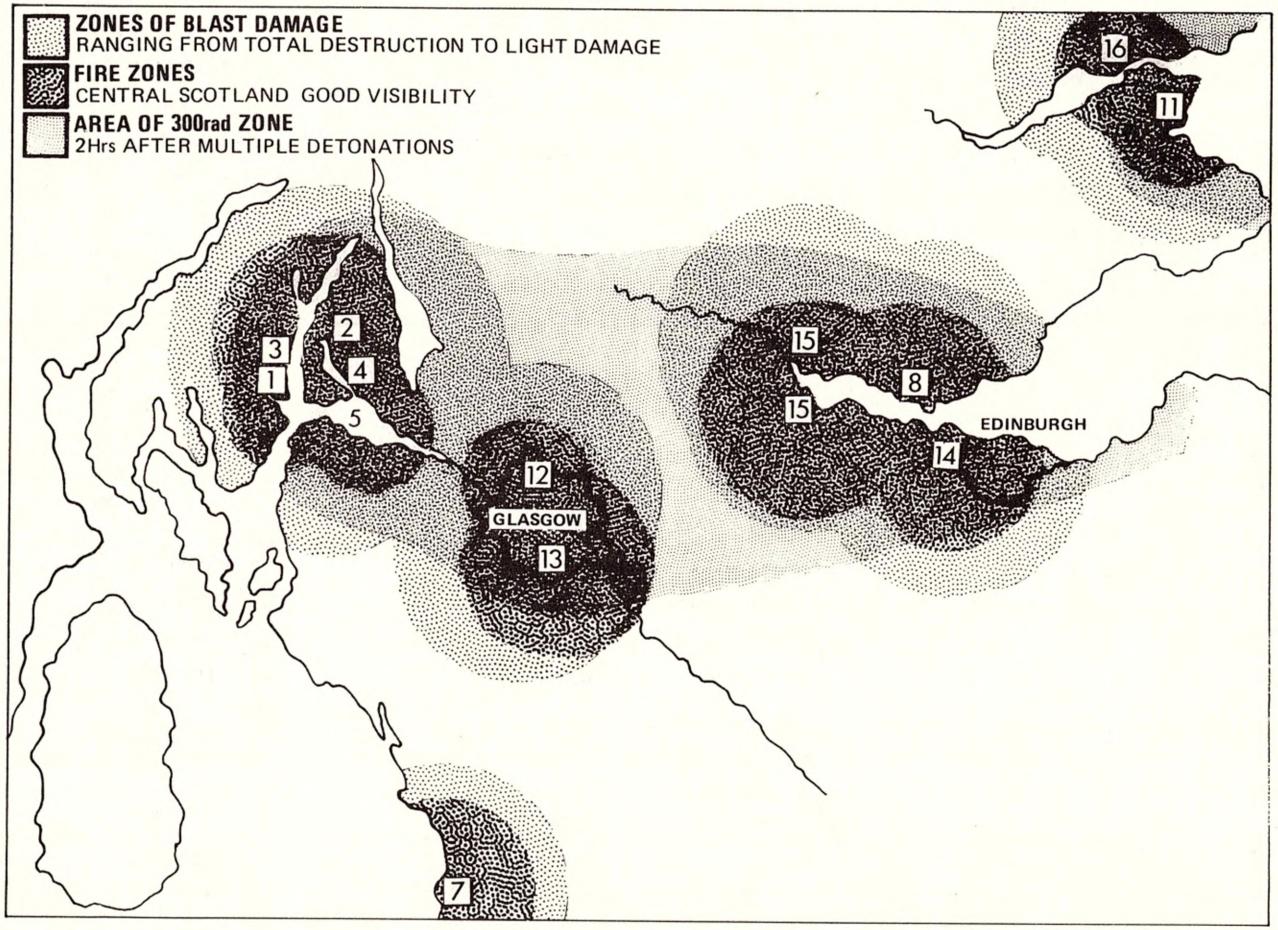
ZONES OF BLAST DAMAGE
RANGING FROM TOTAL DESTRUCTION TO LIGHT DAMAGE
FIRE ZONES
CENTRAL SCOTLAND GOOD VISIBILITY
AREA OF 300rad ZONE
2Hrs AFTER MULTIPLE DETONATIONS
16
11
2
3
1
4
5
15
8
15
EDINBURGH
14
12
GLASGOW
13
7

Table 2

LOCAL GOVERNMENT DISTRICTS		Total Population	Dead	Seriously In.	Uninjured
		3,469,000	1,084,900	1,513,300	870,800
City of Glasgow	809,000				
Eastwood	51,000				
Strath Kelvin	84,000				
Bearsden/Milngavie	47,000				
E. Kilbride	84,000				
Hamilton	107,000		**30%**	**45%**	**25%**
Motherwell	153,000	**1,926,000**	577,800	866,700	481,500
Cumbernauld/Kilsyth	62,000				
Inverclyde	103,000				
Renfrew	232,000				
Argyll & Bute	65,000				
Clydebank	54,000				
Prestwick/Ayr	75,000				
City of Edinburgh	456,000				
Midlothian	84,000		**30%**	**45%**	**25%**
W. Lothian	130,000	**990,000**	297,000	445,000	247,500
Dunfermline	128,000				
Falkirk/Grangemouth	144,000				
Clackmannan	48,000		**30%**	**45%**	**25%**
Dundee & N.E. Fife	256,000	**256,000**	76,800	115,200	64,000
City of Aberdeen	208,000		**45%**	**30%**	**25%**
Peterhead/Buchan	14,000		**60%**	**20%**	**20%**
Lossiemouth/Elgin	22,000		**70%**	**15%**	**15%**
Inverness/Nairn	43,000		**30%**	**30%**	**40%**
Thurso	10,000		**30%**	**45%**	**25%**
		297,000	133,300	85,900	77,800

FURTHER READING

Hiroshima, J. Hersey (1978) Penguin Modern Classics

*As Lambs To The Slaughter, Rodgers/Dando (Arrow, 1981)

*The Medical Consequences of Nuclear Weapons, MCANW (1982)

The Fate of the Earth, J. Schell (Picador Books)

The Game of Disarmnament, Alva Myrdal (Spokesman)

Overkill, John Cox (Penguin, 1981)

The Cost of Nuclear Power, Colin Sweet (Anti-Nuclear Campaign, 1982)

* Available by post from:– **Human Ecology Centre**
15 Buccleuch Place
Edinburgh

WHAT CAN I DO?

YOU can join the swelling tide of people who feel the same way: people whose awakening sense of disgust and outrage at the extreme peril imposed upon ourselves and our planet breaks through any feelings of helplessness and commands action – a struggle for survival. To quote Edmund Burke, "No man made a greater mistake than he who did nothing because he could only do a little."

REGIONAL CONTACTS FOR MCANW

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	Borders	Dr. Fingland	036 16216 (H)
	Dundee	Susan McAllion	0382 826678 (H)
	Edinburgh	Dr. Ratcliffe	031 667 0687 (H)
	Glasgow	Dr. Naftalin	041 427 1395 (H)
	Stirling	Dr. John Kelt	0786 4470 (H)
WALES:	Cardiff	Dr. McPherson	0222 496760 (H)
	Gwynedd	Dr. Richards	0248 81033 (H)
N. IRELAND:	Dr. Kerr	0238 541666 (H)	
ENGLAND:	Bedford	Dr. Green	0908 544397 (H)
	Birmingham	Dr. Williams	021 449 0123 (H)
	Bristol	Dr. Hartog	0272 569850 (H)
	Cambridge	Dr. Shutter	0223 353162 (H)
	Cumbria	Ruth Balogh	094 686 447 (H)
	Derbyshire	Dr Hyde	0629 823329 (H)
	Dorset	Dr. Sepping	0202 708649 (H)
	Essex	Mr. Bardiger	0245 352803 (W)
	Exeter	Dr. Lester	0392 51063 (H)
	Gloucester	Jackie Smith	04536 5568 (H)
	Ipswich	Dr. Ward	03947 412 (H)
	Liverpool	Mr. Marrow	051645 5711 (H)
	London	Dr. Worsley	01 968 9618 (H)
	Manchester	Dr. Gleisner	061 445 5960 (H)
	Newcastle	Mr. Robson	089 426 7505 (H)
	Norwich	Dr. Stevenson	0379 74464 (H)
	Nottingham	Madelaine Wells	0606 264905 (H)
	Oxford	Dr. Cowie	0865 724789 (H)
	Portsmouth	Dr. Ryle	0705 698321 (H)
	Shropshire	Dr. West	0694 722554 (H)
	Staffordshire	Dr. Baker	Oakhurst, Lichfield
	Sussex	Jessica Rook	0273 400791 (H)
	Wiltshire	Dr. Miller	038 081 2575 (H)
	Yorkshire (South)	Dr. French	0742 585448 (H)
	Yorkshire (N/W)	Dr. Arblaster	0422 41982 (H)

OTHER USEFUL CONTACTS

1. Scientists Against Nuclear Arms (SANA)
   Edinburgh: Dr Longman 031 229 5322 (H)

National Organising Secretary: Barbara Pearc
11 Chapel Street
Woburn Sands
Milton Keynes

2. Campaign for Nuclear Disarmnament (CND)
   Edinburgh: c/o Trades Council
   Picardy Place
   Edinburgh

3. Parents for Survival
   Edinburgh: L. Dyer 031 447 8148
   Glasgow: K. Caldwell 041 632 1099

4. Educational Campaign for Nuclear Disarmnament (Teachers)
   Edinburgh: Alastair Seagroatt 031 661 9232

5. Christian CND (Edinburgh)
   C. Galloway 031 229 7318 (W)
   031 552 9089 (H)
   Arthur Chapman 031 667 3279

WHAT CAN YOU DO?

* **LEARN** as much as you can about the effects of nuclear weapons, the arms race, etc. This booklet may be a start. You will find more information in literature.. Read books and pamphlets, watch TV programmes, see "THE WAR GAME" and go to meetings about these issues. You can form part of the *chain of reaction of awareness* which Einstein saw was necessary after Hiroshima and Nagasaki, and is all the more necessary now.

* **TELL** other people what you know. Talk about the urgency of disarmament to your family, friends, people at work. They may not agree at once, but they may start to think and to find out.

* **WRITE** letters to, and talk to, your political representatives, letting them know your views, and asking for theirs. Make sure that they have to be well informed about this issue. Public opinion is enormously important. Even willing politicians cannot act without it, and unwilling ones cannot ignore it for long.

* **ORGANISE** in groups for mutual support and special aims – in local areas, churches, trade unions, political parties, professional groups etc. Use your own talents to help the groups, whether they lie in public speaking, organising, typing, doing art work, or whatever.

* **USE** the media to express your views. Write letters to newspapers or journals and take advantage of radio phone-in programmes. You can reach huge numbers of people in this way.

* **TAKE PART** in conferences, marches, demonstrations, petitions, stand up and be counted.

APPENDIX

During the preparation of this booklet members of the public were interviewed by MCANW members. A high proportion of those interviewed expressed concern about the possibility of a nuclear power station going out of control or being struck by a nuclear weapon. The following paragraphs should answer most of the questions posed.

As many as 200 isotopes (i.e. different radio-active species) of the atoms of about 35 elements are released in a nuclear fission detonation. Their half-lives (i.e. the time taken to lose 50% of their radio-activity) vary from fractions of a second to thousands of years. For the period of one hour after detonation until 100 days after the detonation the average decay rate of all the various released isotopes follows the 7/10 rule. If we use the rule for a dose rate of say 400 rads/hour then seven hours after the detonation the radio-activity will have dropped to 1/10th of its original level, i.e. 40 rads/hour, 49 hours (7 x 7 hours) after the detonation the radio-activity will have dropped to 1/100th (i.e. 1/10th times 1/10th) of its original level or 4 rads/hour, 343 hours (i.e. 7 x 7 x 7 hours) after the detonation radio-activity will have fallen to 1/1000th (i.e. 1/10 x 1/10 x 1/10) of its original level or 0.4 rads/hour. This assumes that no additional radio-active material, "fall-out" is depositied after the first hour. A most unlikely event.

There are a greater proportion of isotopes with long half-lives released when a nuclear reactor melts down or is struck by a nuclear weapon. Long-lived isotopes are generally less intensely radio-active that short-lived ones, the half-lives of isotopes released in this stituation can vary from seconds to for example 28 years in the case of ^{90}Strontium, 30 years for ^{137}Casesium and 24,000 years in the case of ^{239}Plutonium.

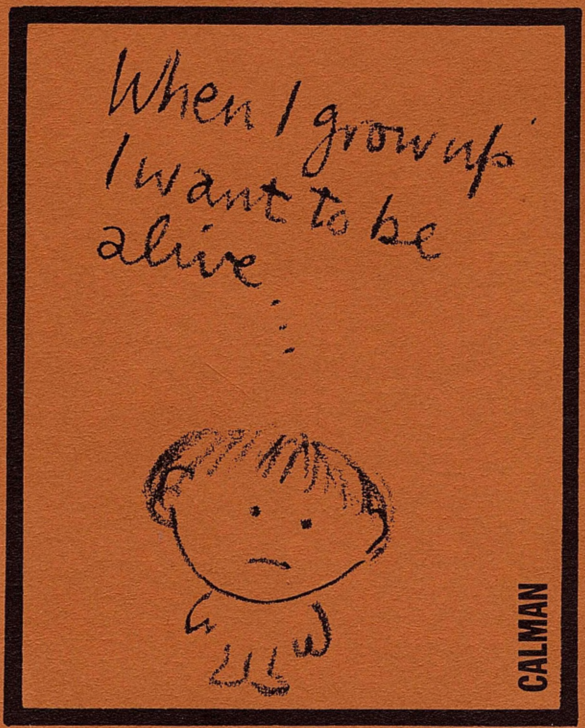
The table below shows the comparative radiation effects of a nuclear reactor melt-down, a one-megaton nuclear detonation on a non-nuclear target and a one-megaton detonation on a 1000 megawatt nuclear power station.

Area of	400 rems/24h	100 rems/yr	50 rems/yr	10 rems/yr
Nuclear reactor melt down	1 sq miles	3 sq miles	9 sq miles	68 sq miles
One megaton ground burst	400 sq miles	18 sq miles	26 sq miles	120 sq miles
One megaton bomb on 1000 megawatt nuclear power station	500 sq miles	680 sq miles	1700 sq miles	8600 sq miles

From the above table we can see that were a one-megaton bomb to explode on e.g. Hunterston Nuclear Power Station with the prevailing wind westerly most of Central Scotland would be rendered uninhabitable.

Note: The present maximum accepted radiation dose to civilians in the U.S.A. is 2 rems per year; the limit for the Nuclear industry is 5 rems per year. 50% of the people who absorb more than 50 rems per year will show signs of radiation sickness.

Ref: Steven A Fetter and Kosta Tsipis, "Catastrophic Releases of Radioactivity", Scientific American, April 1981.



Calman

Cartoon 'copyright: Mel Calman'

Price: 50 pence