A HIGHER FORM OF KILLING

The Secret Story of Gas and Germ Warfare

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In the winter of 1943, a year and a half after the first sheep had died on Gruinard, the Allies began to manufacture a biological bomb. It weighed 4 lb and was filled with anthrax spores which were given the code-name 'N'. Its design was largely British, its manufacture exclusively American.

At the time, N was probably the greatest Allied secret of the war after the atomic bomb. All documents connected with it carried the highest security classification: 'Top Secret: Guard' (which the Americans jokingly translated as 'Destroy Before Reading'). In February 1944, when Lord Cherwell, Churchill's scientific advisor, wrote the Prime Minister an account of N, the official typist left blanks in the typescript which Cherwell went through and filled in by hand.

N spores [he told Churchill] may lie dormant on the ground for months or perhaps years but be raised like very fine dust by explosions, vehicles or even people walking about . . . Half a dozen Lancasters could apparently carry enough, if spread evenly, to kill anyone found within a square mile and to render it uninhabitable thereafter . . .

. . . This appears to be a weapon of appalling potentiality; almost more formidable, because infinitely easier to make, than tube alloy [the code-name

for the atomic bomb]. It seems most urgent to explore and even prepare the counter-measures, if an there be, but in the meantime it seems to me we cannot afford not to have N bombs in our armoury.[68]

From its small beginnings in a wooden hut at Porton, the biological warfare programme – only four years old – now promised to produce the most potent weapon of mass-killing yet devised. N obviously carried enormous implications for the future of the war, and Churchill immediately invoked security procedures similar to those which surrounded the Manhattan Project. Instead of raising the subject with the full Defence Committee, the Prime Minister initialled Cherwell's minute and passed it on to his trusted liaison officer, General Ismay, instructing him to keep it 'in a locked box' and to raise it personally with the three Chiefs of Staff.

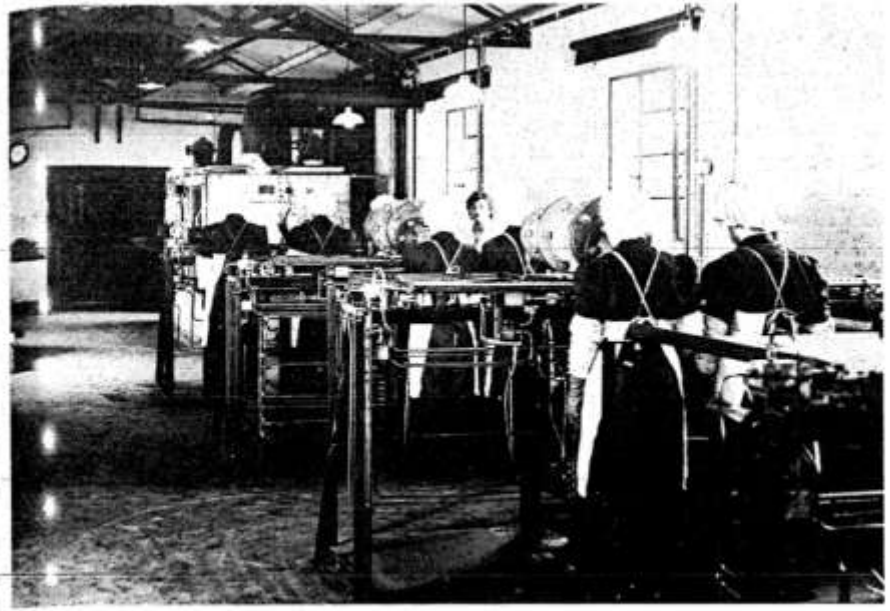
One day later, on the morning of 28 February, Ismay read Cherwell's paper to a secret session of the Chiefs of Staff Committee. 'They feel', he told Churchill that afternoon, 'that Hitler would not hesitate to indulge in this form of warfare if he thought that it would pay him to do so, and that the only deterrent would be our power to retaliate. The Chiefs of Staff accordingly agree with Lord Cherwell that we cannot afford not to have N bombs in our armoury.'[69]

Lord Hankey had by now left the chairmanship of the Bacteriological Warfare Committee (although he would return to it after the war). In his place was Ernest Brown, the Chancellor of the Duchy of Lancaster. On 8 March, after what he described as 'the most secret consultations with my military advisors', Churchill ordered Brown to place an order with the Americans for half a million anthrax bombs: 'Pray let me know when they will be available. We should regard it as a first instalment.'

I should also like [continued Churchill] to have an early report from you as to what would be involved in producing the material on a considerable scale in this country. It might be preferable to fill our bombs over here.[70]

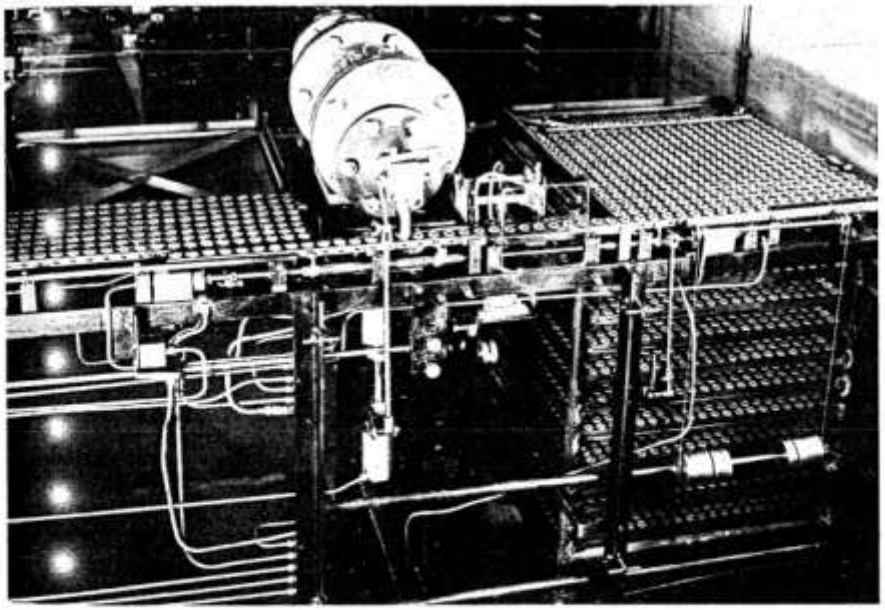
It was clearly galling for the Prime Minister to see what had once been a British project swamped by the larger American one. Yet there was no alternative. In May Brown wrote back to tell him that a full-scale biological programme was simply beyond the scope of the British economy:

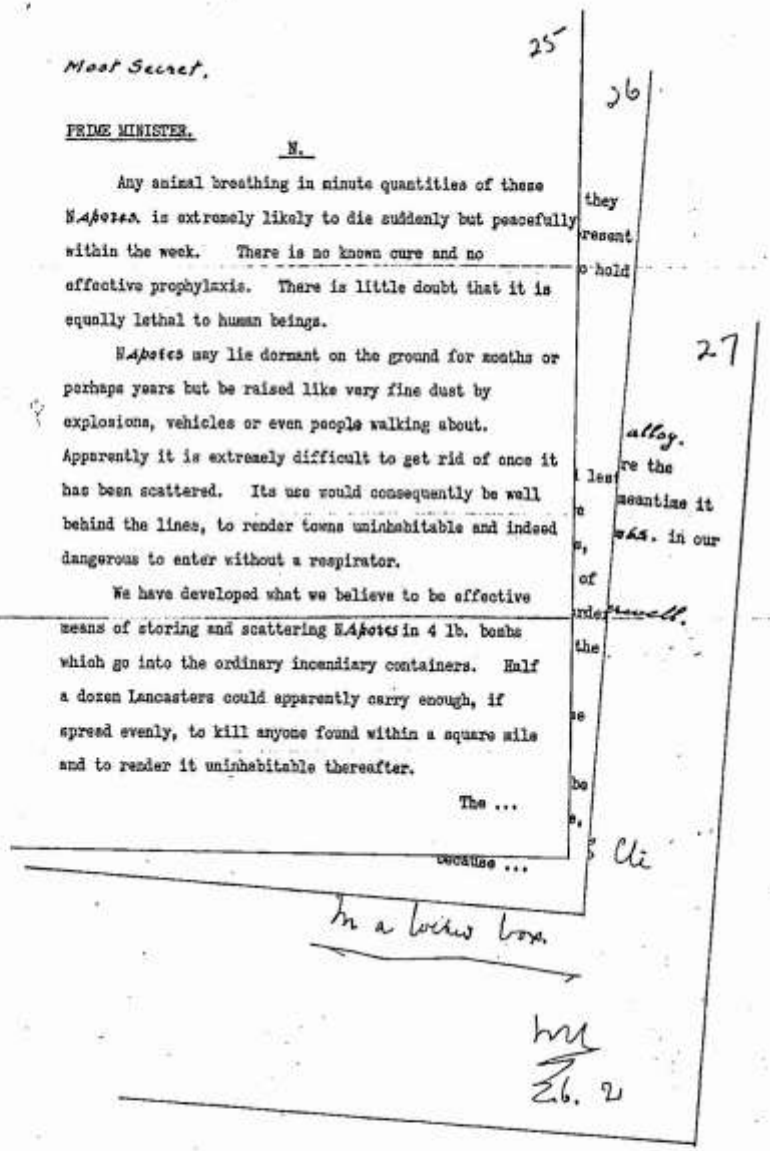
The existing small pilot plant in America requires 500 men (bacteriologists, laboratory assistants, chemical engineers and skilled operators), so that we



7 & 8 The men who pioneered the Allies' wartime germ weapons programme. *Above*, a rare photograph taken near the Scottish isle of Gruinard in 1942, where the scientists first tested the anthrax bomb. *L to R*: David Henderson, Donald Woods, O. G. Sutton and W. R. Lane. *Right*, Dr Paul Fildes, leader of the British biological warfare team.

9 & 10 *Opposite*, in a large shed at Porton Down in 1942, munitions workers using specially designed equipment were to fill five million small cattle cakes with anthrax – almost certainly the world's first mass-manufactured germ weapon. These photographs are at odds with Britain's 1980 claim never to have possessed 'biological agents . . . in quantities which could be employed for weapon purposes'.





Most Secret.

PRIME MINISTER.

N.

Any animal breathing in minute quantities of these Anthrax is extremely likely to die suddenly but peacefully within the week. There is no known cure and no effective prophylaxis. There is little doubt that it is equally lethal to human beings.

Anthrax may lie dormant on the ground for months or perhaps years but be raised like very fine dust by explosions, vehicles or even people walking about. Apparently it is extremely difficult to get rid of once it has been scattered. Its use would consequently be well behind the lines, to render towns uninhabitable and indeed dangerous to enter without a respirator.

We have developed what we believe to be effective means of storing and scattering Anthrax in 4 lb. bombs which go into the ordinary incendiary containers. Half a dozen Lancasters could apparently carry enough, if spread evenly, to kill anyone found within a square mile and to render it uninhabitable thereafter.

The ...

because ...

In a locked box.

Lord Cherwell's minute to Churchill about the 'appalling potentiality' of anthrax. As a security precaution, the typist left blanks in the text which Cherwell filled in by hand (*Public Record Office*).

should require not less than 1,000 men for a plant of even moderate size. Even if enough skilled workers capable of handling the highly dangerous work could be obtained, there would be serious interference with existing work on medicine and the fermentation industries. Also, any plant erected in this country would be susceptible to danger of air attack, with the particular risks likely to result from a dispersal of the product.[71]

Britain would have to take whatever the Americans chose to give her.

In May 1944 an initial batch of 5,000 anthrax-filled bombs came off the experimental production line at Camp Detrick. In July the first full-scale production is believed to have got under way at a factory whose precise location has not been disclosed. It had a capacity for producing 50,000 Porton 'Type F' 4 lb bombs a month, and its entire production was turned over to the British. This would mean, estimated Brown 'that up to a quarter of a million bombs should be made and filled on our behalf by the end of the year.'[72] The bombs were to be shipped to Britain for storage in case they were needed quickly for 'operational use' in the European theatre. It was a project with obvious hazards. 'Consideration,' wrote Brown to Churchill, 'is being given to the questions of what information as to the contents of the bombs should be given to transport authorities; what instructions should be given to those who will have to handle the bombs; and also what information should be given to certain categories of Intelligence Officers and to the Medical Services.'[73]

The main centre for the production of the Americans' biological bombs was at Vigo in Indiana. Built at a cost of $8,000,000 it employed around 500 people. The disease organisms were designed to be cultivated over a four-day cycle in twelve 20,000 gallon tanks, harvested and then filled into the Americans' own modified version of the Porton 'Type F' bomb, the 'E48R2'. Vigo was capable of producing over 500,000 anthrax bombs a month,[74] or 250,000 bombs filled with botulinus toxin. 'Both of these agents,' wrote one US expert, 'store well and could be stockpiled on a large scale.' The raw materials required for a month's output at Vigo were 300,000 lb of glucose or cerelose, 625,000 lb of corn steep liquor, 1,000,000 lb of yeast, 50,000 lb of casein, 20,000 lb of peptone and 190,000 lb of phosphates. The Vigo plant was highly dangerous to operate and although it was ready to go into production early in 1945 it was never actually used. At the end of the war the factory was leased to an industrial concern for the production of antibiotics. It could, how-

ever, have been put back into production in an emergency within three months, although 'only with great hazard to the operators'.[75]

Biological warfare as envisaged during the war would have had one simple aim: to wipe out such a huge proportion of the enemy's population that his whole war machine would cease to function. Accordingly, as Paul Fildes put it in a top secret memo after the war, N was 'designed for strategic bombing'.[76] Individual 4 lb anthrax 'bomblets' were loaded – 106 at a time – into 500 lb cluster bombs designed to burst in mid-air and scatter the spores over as wide an area as possible.

A contingency plan to use N against Germany was drawn up by the British during the war. Rough calculations based on 'results from actual field trials and experiments on monkeys' suggested that if six major German cities – the ones selected were Berlin, Hamburg, Stuttgart, Frankfurt, Wilhelmshafen and Aachen – were simultaneously attacked by a heavy bomber force carrying 40,000 500-lb bombs, '50 per cent of the inhabitants who were exposed to the cloud of anthrax might be killed by inhalation, while many more might die through subsequent contamination of the skin'.

> The terrain will be contaminated for years, and danger from skin infection should be great enough to enforce evacuation . . .
>
> There is no satisfactory method of decontamination. There is no preventative inoculation . . .[77]

It would have taken the Americans eight months to have built up the stock of four and a quarter million 4-lb bombs necessary to mount the attack; 2,700 heavy bombers would have been used in the operation. The death toll in Germany would have been around three million.

We cannot be sure when this plan was drawn up. As one of the target cities – Aachen – fell to the Allies in October 1944 it is reasonable to assume that it was composed before then, possibly in the summer of 1944. We now know that if the war had gone badly for the Allies N might well have been used.

The development of biological weapons was accelerating as the war ended. Attempts were made to develop a method of spraying anthrax from aircraft. Anti-personnel mines were designed. 'The mines,' according to Fildes, 'would contain preformed pellets coated with

some suitable biological agent.'[78] Looking ahead, he foresaw a role for germ weapons in the rocket age.

According to another British expert, Brigadier Owen Wansbrough-Jones, in evidence to a top secret sub-committee of the Chiefs of Staff shortly after the end of the war, anthrax 'was 300,000 times more toxic than phosgene'. He predicted that germ weapons would be a hundred times more efficient within ten years.[79] In confirmation of his view, in December 1945, Dr Henderson, Fildes' deputy, reported 'that as a result of continued research the potency of N has been stepped up to the order of ten times. In Dr Fildes' judgement this confirms his statement that continued research by good men may produce important improvements.'[80]

Judged by today's standards, anthrax is a crude weapon. It not only destroys populations wholesale, it renders the cities in which they live uninhabitable for generations. The conquerors would inherit little more than a poisoned desert. According to the Director of Porton Down, speaking in 1981, if anthrax had been used against Berlin in the war, the city would still be contaminated today.[81]

Near the end of the war, the Americans, aware of N's limitations, went on to develop 'US', a weapon designed to spread brucellosis. Like mustard gas, brucellosis has the attraction of a low mortality rate (around 2 per cent) but at the same time a tremendous capacity to inflict casualties. It causes 'chills and undulating fever, headache, loss of appetite, mental depression, extreme exhaustion, aching joints and sweating'.[82] In severe cases, it can put a man out of action for a year. It is also highly infectious: whereas only 200 workers were claimed by the Americans to have been affected by their work on anthrax during the war, virtually everyone associated with the brucellosis programme is said to have felt its effects for a time. The bomb-load required to attack a city was found to be less than one-tenth that of anthrax; the target itself would be contaminated for only a matter of days. By 1945, according to Fildes, US was 'in an advanced stage of development'.[83] As the war ended, the stocks of anthrax-filled cattle cake stored at Porton Down since 1942 were incinerated.[84] From its crude beginning, the Allied biological warfare programme had, in three years, reached a position in which it was being considered in the same breath as the atomic bomb. In his evidence to the Chiefs of Staff Technical Warfare Committee in December 1945, Wansbrough-Jones described the two types of warfare as 'complementary' and suggested that in future germ

weapons might be used 'in minor wars on which it was not worth using atom bombs; or major ones in which they were being barred'. The development of brucellosis in particular offered a role for germ warfare in the future.

> Biological warfare need not remain a method of warfare repugnant to the civilised world. The further development of types such as US coupled with *a certain amount of informed guidance of the public* [authors' italics] might well result in its being regarded as very humane indeed by comparison with atom bombs.[85]

There was no longer any talk of a weapon which had been acquired 'solely for defensive purposes'. By the end of the war, the programme to develop germ warfare had picked up a momentum of its own: work went on long after it was obvious that Hitler and the Japanese were in no position to mount such an attack. The result was a hidden arsenal of anti-crop sprays, poison gas and germ weapons which the British and Americans have been at pains to play down ever since. On at least one occasion, in 1944, the British very seriously considered using them. Far from being 'a study in restraints' as one writer has described it,[86] the story of chemical and biological warfare in the Second World War is one of massive stockpiling, subterfuge, blundering, bluff and secret preparation. The world was spared the horrors of germ and gas warfare not by any noble desire to obey international law, but by a chapter of historical accidents.

FIVE
The War That Never Was

. . . it may be several weeks or even months before I shall ask you to drench Germany with poison gas, and if we do it, let us do it one hundred per cent. In the meanwhile, I want the matter studied in cold blood by sensible people and not by that particular set of psalm-singing uniformed defeatists which one runs across now here now there.

Winston Churchill in a 'Most Secret' minute to the Chiefs of Staff. 6 July 1944.[1]

Hours after war was declared, in September 1939, the British ambassador in Berne paid a brief visit to the Swiss Foreign Ministry. He delivered a short message from the British and French governments to be passed on to Hitler. The two countries promised to abide by the Geneva Protocol and refrain from using poison gas and germ warfare, provided the Nazis undertook to do the same. A few days later the German ambassador signalled his country's agreement.

Neither side placed much faith in the bargain. Mention the word 'gas' to any British man or woman over the age of fifty and you are likely to trigger off a series of memory associations: the voice of Neville Chamberlain at the time of the Munich crisis, the sight of children and babies in respirators, the suffocating feeling of first trying on the standard civilians gas mask, the inconvenience of having constantly to carry this strange metal and rubber object in its fragile cardboard box. Crouched in the dark, through innumerable air raids, they waited for a gas attack which in the end never came. At the end of the war, the British alone had manufactured 70 million gas masks, 40 million tins of anti-gas ointment and stockpiled 40,000 tons of bleach for decontamination; 10 million leaflets had been prepared for immediate distribution in the event of chemical attack, and by a long-standing arrangement the BBC would have interrupted programmes with specially prepared gas warnings.[2] Contingency planning ran down to the smallest details. Civilians 'lightly contaminated by gas spray or mustard gas bombs' would have been advised

'to go home, discard their clothes, take a bath and put on a complete change of clothing'. More serious casualties would be sent to special clearing stations, undressed and 'issued with a simple form of garment to enable them to reach home and would be given a small bag in which to take their personal valuables'. Their contaminated clothes would be sent to dry cleaners – specially requisitioned for the purpose – decontaminated and returned.[3]

Over forty years later it is difficult to appreciate just how great the fear of gas was. It was not a fanciful 'terror weapon' – virtually everyone in the country knew someone who had been gassed in the First World War, and knew also that the modern bomber now made it possible for the frightfulness of Ypres to be delivered into the living room. In the early months of enemy bombing, when no one knew what to expect, gas was the most dreaded horror of all.

Chemical warfare loomed equally large in military minds. Right from the start each side worked on the assumption that the other would initiate chemical warfare. When the British Expeditionary Force went to France at the beginning of the war, the General Staff reckoned the Germans would use 160 heavy bombers to deliver 18,000 gallons of mustard gas every twenty-four hours; a third of the entire force was expected to be contaminated daily.[4] Throughout the war, chemical weapons and stocks of anti-gas equipment were moved on to every major battlefield: there were gas dumps in France in 1940, in North Africa, in the Far East, the Middle East, in Italy, on the Russian Front and finally in 1944 in France once again. For six years the introduction of gas warfare continued to be regarded as a day to day possibility by both sides. As a result, poison gas factories swallowed up the war effort of tens of thousands of scientists, technicians and skilled workers. Production never slackened, and by 1945 the world's major powers had amassed around half a million tons of chemical weapons, five times the amount used in the whole of the First World War. Why these enormous reserves were never used has intrigued soldiers and historians ever since. Contrary to most expectations, in this one aspect of warfare – often by the thinnest of margins – the world managed to preserve a precarious peace.

The success of the German *Blitzkrieg* through the Low Countries and northern France in May 1940 at first made worries about gas warfare irrelevant. It did not fit into the strategy of rapid armoured thrusts supported by air strikes which the Germans used to win the

Battle of France: gas slows down armies by forcing them to don respirators and decontaminate their vehicles constantly. Using chemical weapons would in fact have favoured the British and the French, but there is no evidence to suggest that they ever considered doing so. Their stocks could not have lasted for more than a few days, and their commanders – still reeling in shock at the scale of the Wehrmacht's successes – were in no state to add further to the chaos by introducing gas. The campaign ended in four weeks without either side resorting to gas. Only against the stricken British army on the beaches of Dunkirk would an aerial attack using mustard have made sense, but by then Hitler was eager to arrange a peace treaty; gassing helpless soldiers would have destroyed the chances of any negotiations before they even started.

It was the British, in the summer of 1940, who drew up the first serious plans for using gas. On 15 June 1940, only two days after Dunkirk, the Chief of the Imperial General Staff, Sir John Dill, circulated one of the most explosive memoranda of the war. Restricted to a few of the country's top military commanders, shrouded in secrecy for over thirty years, it was entitled 'The Use of Gas in Home Defence'[5] – a brief and cogent military argument in favour of spraying an invading German army with mustard gas.

'So far during this campaign,' began to Dill, 'Germany has not used gas. We may assume that this omission is not from humanitarian reasons but because up to the present it would not have been to her advantage to do so . . .' In the event of an invasion this might well change, and Dill suggested that the War Cabinet be asked to allow the armed forces 'to anticipate the use of the gas by the enemy, by ourselves taking the initiative in our defence against invasion, even if Germany or Italy has not by that time started chemical warfare.'

> There are strong military arguments in favour of such action. Enemy forces crowded on the beaches, with the confusion inevitable on first landing, would present a splendid target. Gas spray by aircraft under such conditions would be likely to have a more widespread and wholesale effect than high explosives. It can moreover be applied very rapidly, and so is particularly suitable in an operation where we may get very little warning.
>
> . . . Besides gas spray, contamination of beaches, obstacles and defiles by liquid mustard would have a great delaying effect. The use of gas in general would have the effect of slowing up operations, and we believe that speed must be the essence of any successful invasion of this country.
>
> There are of course grave objections to taking this step . . .

Dill mentioned two 'grave objections' in particular. 'We have bound ourselves not to use gas except in retaliation. To break our word may tend to alienate American sympathy.' In addition, British use of gas would 'immediately invite retaliation against our industry and civil population.' Dill nevertheless considered the risks worth taking and he ended his advocacy of the initiation of gas warfare in ringing tones:

> While the probable repercussions must be fully realised I consider that the military advantages to be gained are sufficient to justify us in taking this step. We must expect the Germans to spring one or more surprises on us as part of their invasion plan. We may be sure that every detail of that plan has been meticulously worked out. Some unexpected action on our part, taken promptly and vigorously, might throw all their arrangements out of gear. At a time when our National existence is at stake, when we are threatened by an implacable enemy who himself recognises no rules save those of expediency, we should not hesitate to adopt whatever means appear to offer the best chance of success.

Desperate though the British plight was in June 1940, Dill's proposal ran into a wall of opposition from the military establishment. The Director of Home Defence, on the same day he received the memorandum, scrawled Dill a curt handwritten note:

> I do *not* agree that this is a sound suggestion.
>
> We should be throwing away the incalculable moral advantage of keeping our pledges and for a minor tactical surprise; & the ultimate effects of retaliation by the enemy would be very serious in this overcrowded little island.[6]

Even stronger condemnation came from one of Dill's own staff, Major-General Henderson, who described it as a 'dangerous' proposal: 'such a departure from our principles and traditions would have the most deplorable effects not only on our own people but even on the fighting services. Some of us would begin to wonder whether it really mattered which side won.'[7]

In the face of such strong opposition, Dill withdrew his memorandum. But two weeks later, on 30 June, his views suddenly found the backing of the most powerful man in the country – Winston Churchill. After the war, in considering what might have happened if the Germans had invaded, Churchill wrote: 'They would have used terror, and we were prepared to go to all lengths.'[8] 'All lengths',

recently declassified documents show, would have included initiating gas warfare:

> Let me have [he instructed General Ismay] a report upon the amount of mustard or other variants we have in store, and whether it can be used in air bombs as well as fired from guns. What is our output per month? It should certainly be speeded up. Let me have proposals. Supposing lodgements were effected on our coast, there could be no better points for application of mustard than these beaches and lodgements. In my view there would be no need to wait for the enemy to adopt such methods. He will certainly adopt them if he thinks it will pay. Home Defence should be consulted as to whether the prompt drenching of lodgements would not be a great help. Everything should be brought to the highest pitch of readiness, but the question of actual employment must be settled by the Cabinet.[9]

It is conceivable that Churchill's instruction was the result of a private approach from Dill; at any rate, the anti-gas lobby were immediately swept aside. Within a week, Britain had scraped together her meagre stocks of gas and had them loaded into aircraft spray tanks and bombs at more than twelve RAF bases from Scotland to the South Coast: all were operationally ready to mount a chemical attack by the end of the first week of July.[10]

Had the German invasion come it would have been met by squadrons of Lysander, Blenheim, Battle and Wellington bombers loaded with spray tanks holding between 250 and 1,000 lb of mustard. 'Low spray attacks,' wrote the Inspector of Chemical Warfare, 'on an enemy approaching our shores in open boats or after landing are likely to be effective if frequently repeated, and will ultimately result in 100 per cent casualties among the men hit by the spray. If the enemy are not wearing eyeshields, a considerable number will be blinded unless they cover their eyes, They cannot do this and use their weapons at the same time. Low spray attacks are therefore likely to reduce the risk to other low-flying aircraft in bombing and machine gunning.'[11]

Britain had only 450 tons of mustard gas in stock (less than one-twentieth of the amount held by the Germans) and the effort would have been concentrated on trying to deliver the whole amount in a single day, to drive the invading Germans straight back into the sea. It was thought that the Germans would not be coming ashore with any spare clothes: 'repeated low spray attacks will leave him defenceless against blistering'. The RAF thus planned to mount the

maximum possible number of sorties in a single day. Having made its bombing run over the beach-head and released its gas, it was calculated that each aircraft 'should be able to return the empty tanks to a landing ground near the charging station, and pick up full tanks without delay. Refilling of tanks should only be a matter of hours.'[12]

In addition to spray, 30 lb and 250 lb gas bombs would have been used against 'quays or other areas where stores are being landed'. Although there would be some shelling using gas, and there were 6,000 Livens drums ready to be fired, the main effort would have been delivered by air. 'I consider the results to be obtained from air attack to be so much greater than any other method that, with the limited quantities of gas now available, every gallon should be used for the air arm.'[13]

Dill told Churchill that from the 5 July onwards Britain would be able to mount an aerial gas attack 'on a considerable scale for a limited period' – in all, Bomber Command could carry enough mustard 'to spray a strip 60 yards wide and some 4,000 miles long'. Apart from around 50 tons of phosgene, this represented the whole of Britain's offensive capability, and Dill estimated the spring of 1941 as the earliest possible date on which the country could wage a chemical war using land weapons.[14] In other words, had an invasion actually been mounted by the Germans and Churchill had carried out the plan to use gas, he would have been staking everything on one throw of the dice: he would have to defeat the Wehrmacht in a single day. If he failed the Germans would be able to use chemical weapons without fear of retaliation, possibly as a terror weapon against civilians to try and break the country's will to carry on fighting.

For Churchill it was an intolerable situation. As far back as 1938 the Cabinet had asked for a productive capacity of 300 tons of mustard gas per week and a reserve of 2,000 tons. On 13 September 1939 this target has been reaffirmed by the War Cabinet of which he had been a member. Now he was being told that the RAF had stocks for only one or two days' action. The situation, he wrote, caused him 'grave anxiety': 'What is the explanation of the neglect to fulfil these orders, and who is responsible for it?'[15] The Chiefs of Staff blamed the Ministry of Supply, and Churchill promptly ordered an inquiry. 'I feel this is a very great danger . . . I am determined to proceed against whoever was responsible for disobeying War Cabinet orders without even reporting what was going on.'[16]

The inquiry was headed by Clement Attlee, leader of the Labour Party and Lord Privy Seal in the coalition government. He traced the fault to Sir William Brown, Permanent Secretary to the Ministry of Supply, but wrote that 'it would not be right to attribute to any one individual the responsibility for failure'. Brown kept his job.[17]

Instead – in a move which showed the importance Churchill attached to a ready supply of poison gas – the Prime Minister ordered weekly reports of gas production to be submitted personally to him. Every Friday the Secretary to the Cabinet brought the Prime Minister a set of typed figures. For more than two years, Churchill anxiously scanned them, generally scrawling a comment on the bottom sheet: 'Press on' (15 November 1940); 'Press on. We must have a great store. They will certainly use it against us.' (20 November); 'Press on' (13 February 1941); 'Those concerned should be beaten up' (5 April).[18] By January 1941 production of mustard was still only running at 130 tons a week, a third of full capacity, and Churchill asked Lord Beaverbrook, the dynamic Minister for Aircraft Production, to ginger things up. Beaverbrook sacked one official and stopped all holidays. In July 1941, after yet another fall in production, Churchill wrote in exasperation:

> The absolute maximum effort must be used with super priority to make, store and fill into containers, the largest possible quantities of gas. Let me know exactly who is responsible for this failure. At any moment this peril may be upon us.[19]

By the autumn of 1941, although the threat of invasion had receded, the production of chemical weapons, under Churchill's relentless pressure, began to accelerate. By 31 October, Britain had built up a reserve of 13,000 tons of poison gas. To boost production further, Beaverbrook authorized an additional expenditure on gas installations of £3,500,000.[20] There were soon to be almost 6,000 people employed in researching and manufacturing chemical weapons in Britain.

They worked in four main centres, protected by military guards and armed factory police. The chief mustard gas plant was at Randle, near Runcorn in Cheshire – hundreds of tons of mustard were stored in five-ton steel 'pots' encased in concrete. Phosgene was manufactured at the nearby Rocksavage works and stored 'in drums in splinter-proof trenches'. Runcorn and Rocksavage are in well-populated areas, and were vulnerable to air attack. The Government

even issued the local inhabitants with special army gas masks. To try and reduce the danger, a third great storage depot was tunnelled into the Welsh hills in the county of Flint: the installation was code-named 'Valley'.

A second Welsh chemical warfare establishment was at Rhydymwyn, near Mold in Clwyd. Here, the Ministry of Supply built a gas factory which was joined, in 1942, by an even more secret installation: an isotope-separation plant, part of the British project to create an atom bomb. The atomic plant employed over one hundred people, supervised by twenty Oxford scientists from the Clarendon Laboratory. Employees from one site were not allowed into the other, but as workers at both had to carry gas masks it was assumed by the local inhabitants that they were all engaged on the same project; this, it was rumoured, was a scheme to manufacture synthetic rubber.

While thousands of munition workers toiled in the factories, Porton Down designed new weapons:

> . . . there was the 'Flying Cow', a gliding bomb which rained gobbets of thickened mustard gas on the ground during its flight (another version with unthickened mustard gas was known as the 'Flying Lavatory'); the 'Frankfurter', an elongated mortar bomb for smoke; the 'Squirt', a portable high pressure projector which threw 2 gallons of liquid hydrogen cyanide in a jet to a range of about 25 yards . . . Perhaps the most ingenious of all the offensive devices was an anti-tank projectile which first pierced a small hole through armour-plate by means of a hollow charge of explosive and then squirted through the hole into the tank enough liquid hydrogen cyanide to kill all the crew. (No acceptable nickname was ever found for this unsporting weapon).[21]

All the while, Churchill continued to pound the Ministry of Supply with threats, instructions, exhortations and advice, normally in the form of 'Action This Day' memoranda. By the end of 1941 he had transformed the situation. The Chiefs of Staff were told on 28 December that Britain could now take offensive action with mustard gas at five hours' notice.[22] Four Blenheim and three Wellington squadrons were trained in the use of aerial spray. 15 per cent of the British bomber force could be employed in chemical warfare. By the spring of 1942 – thanks chiefly to the extraordinary time and trouble Churchill had gone to – Britain had almost 20,000 tons of poison gas.

1 Casualties of one of the first German chlorine attacks, April 1915. The victim could take anything up to two days to die, coughing up pint after pint of yellow liquid – hence the basin by the patient's side.

2 The first British respirators, May 1915. Each man carried a bottle of soda solution with which he was supposed to moisten the flannel. The masks were little protection: on 24 May, 3,500 men were gassed in a single four-hour attack.

29 A CIA poison dart gun produced during 1975 Senate hearings into why the agency had disobeyed presidential orders to destroy stocks of biological weapons.

30 British soldiers training against gas attack, 1980. The new gas training range at Porton Down was evidence of mounting alarm at the prospect of chemical warfare in Europe.

Churchill forged the production programme and Churchill rewrote the country's gas policy. In January 1941, during the 'Victor' anti-invasion exercise, the War Cabinet sanctioned the use of gas.[23] In March 1942, an official minute to the Chiefs of Staff laid down the British position quite clearly: '*It has been accepted* that we should not initiate the use of gas unless it suited our book to do so during the invasion.'[24]

The events of 1940 and 1941 showed that when a country has its back to the wall it is unlikely to put obligations like the Geneva Protocol ahead of military expediency. If a nation's survival is at stake this is perhaps understandable. But as Britain's military position improved, Churchill's willingness to use gas did not diminish. On the contrary – within two years he would actually be pressing for the initiation of gas warfare.

As in every other sphere in the Second World War there was close cooperation between Britain and the United States over chemical warfare. Long before she entered the war, back in the winter of 1940, the Americans secretly began to supply poison gas to the United Kingdom. To preserve her image of neutrality the gas was manufactured in private US plants (which were financed by the British) and then carefully shipped to Europe in foreign-registered vessels; technically the American Government's only official connection was the granting of export licences. At least 200 tons of phosgene a month were being made available to the British using this ruse by the summer of 1941.[25]

It was a remarkable political gamble by the Americans for the deal would have been a propaganda gift to the Germans if they had discovered what was going on. Churchill had opposed the initial approach to the US fearing the repercussions on American public opinion if he should have to use the US gas to repel a German invasion. He was, however, assured that there was strong support in Washington for gassing an invading German army. 'The initial defensive use of gas,' wrote Colonel Barley, the British officer who negotiated the phosgene deal, 'would receive almost universal approbation in America . . . The argument that we had signed a convention did not appear to be a good one either to army officers or prominent industrialists.'[26] Barley's report convinced Churchill. Britain took the gas.

The Americans had a different attitude to chemical warfare from

the British. Every city in Europe was vulnerable to gas attack, and millions of civilians learned to live with the fear that one day what the enemy's bombers brought might not be high explosive, but mustard gas, phosgene or some new 'super gas'. America was out of range of bomber attack – safe from the fear of airborne chemical retaliation against her cities, the US could contemplate the use of poison gas more dispassionately. Unlike Britain, Germany and Russia there were no legal restraints upon the US to prevent her using gas – the Senate had still not ratified the Geneva Protocol. At the same time the existence of an independent Chemical Warfare Service meant that a powerful pressure group was always around to put its case for an increased Congressional appropriation. In 1940 the US spent $2 million on its Chemical Warfare Service; in 1941 when the chemical rearmament programme was launched, this was increased more than thirty-fold, to over $60 million; in 1942 expenditure reached a staggering $1,000 million. There was a corresponding increase in personnel – from 2,000 to 6,000 to 20,000 in 1942. If the Army, Navy and Air Force were all getting more money, so the argument ran, the CWS should surely get some too. As a result America soon had a poison gas-producing capacity vastly in excess of anything she really needed.

In the three years from 1942 to 1945, the US opened thirteen new chemical warfare plants. The most ambitious was the $60 million Pine Bluff Arsenal in Arkansas. Construction work began on 2 December 1941, five days before Pearl Harbor, on a 15,000 acre site. Within eight months an army of labourers and construction experts had laid miles of road and railway track, built factories, storage depots, laboratories, shops, offices, a hospital, a fire station, a police building, water, gas and electricity supplies and a telephone exchange.

After a time, the statistics of the size and scope of the American poison gas programme begin to glaze the eye.[27] Pine Bluff alone, at its peak, employed 10,000 men and women; it even made use of the labour supplied by a nearby prisoner of war camp. From 31 July 1942 when it first went into production, through to 1945, the Arsenal produced literally millions of grenades, bombs and shells filled with chemical agents, as well as thousands of tons of chlorine, mustard gas and Lewisite. At the end of the war most of it had to be dumped in the sea; its manufacture had cost the American taxpayer $500 million.

In 1942 another $60 million installation was opened near Denver in Colorado. The Rocky Mountain Arsenal occupied 20,000 acres, employed 3,000 people and produced 87,000 tons of toxic chemicals by the end of the war. The same year, the Americans opened a test site worthy of their vast investment in chemical warfare – one of the largest gas weapons trial areas in the world, more than a quarter of a million acres on the edge of the Great Salt Lake Desert, in Utah. Known as the Dugway Proving Ground, it was forty times the size of Porton Down and housed test facilities that were a veritable dream for the men of the CWS. Replicas of German and Japanese houses were constructed to examine how well they could withstand chemical attack. Caves were dug into the mountains to see how a well-entrenched enemy might survive a gas shell and bomb barrage. The Americans also acquired from the British an interest in spraying mustard gas from the air; Dugway was so vast there was even room for the USAAF to experiment with high altitude spray. The tests were successful, and the United States, which had entered the war with 1,500 spray tanks, ended it with 113,000.

The Chemical Warfare Service's empire grew huge despite the opposition of the President. Unlike Churchill, Roosevelt had a particular aversion to poison gas, regarding it as barbaric and inhuman. His attitude was well expressed by Admiral Leahy, his senior naval advisor and later President Truman's Chief of Staff. Using gas, said Leahy, would 'violate every Christian ethic I have ever heard of and all of the known laws of war'.[28] Right up until Roosevelt's death, the CWS complained that any proposal they put forward for using poison gas would not be 'seriously considered', but 'immediately rejected due to personal bias' by the President.[29]

Roosevelt was prevailed upon to authorize the giant US programme only because of the widely-held fear that Japan was prepared to initiate gas warfare. Like America, Japan had not ratified the Geneva Protocol, and reports from China continued to suggest that the Japanese were using gas against Chinese soldiers and civilians. One account suggested that 'up to the end of June 1941 the Japanese had used gas 876 times' in their war against Chiang Kai-shek.[30] In October 1941, for example, during a battle in the suburbs of the city of Ichang, Japanese planes were said to have dropped more than 300 gas bombs, many filled with mustard, killing 600 Chinese soldiers and wounding more than 1,000. Photographs of the casualties were published in American newspapers.

Gas atrocity stories make good propaganda, and throughout the war there were regular calls by the US press for America to use gas in revenge. Public opinion polls suggested that as much as 40 per cent of the population favoured the use of gas against Japan, and newspaper headlines screamed their support: 'We Should Gas Japan' (1943); 'You Can Cook 'Em Better With Gas' (1944); 'Should We Gas the Japs?' (1945).[31]

Roosevelt resisted the pressure, although he did issue a series of stern warnings to Japan. 'I desire to make it unmistakably clear,' he stated in June 1942, 'that if Japan persists in this inhuman form of warfare against China or against any other of the United Nations, such action will be regarded by this Government as though taken against the United States, and retaliation in kind and in full measure will be meted out.'[32] The warning was reissued the following year to embrace Germany as well, and expressed in even more sombre language:

> I have been loathe to believe that any nation, even our present enemies, could or would be willing to loose upon mankind such terrible and inhumane weapons . . . We promise to pay any perpetrators of such crimes full and swift retaliation in kind and I feel obliged now to warn the Axis armies and the Axis people in Europe and in Asia that the terrible consequences of any use of these inhumane methods on their part will be brought down swiftly and surely upon their own heads.[33]

It was not to be until the end of the war that the Americans discovered just how exaggerated had been their fears of Japanese gas stocks. Japanese offensive work had actually reached its peak in 1935. After that it had gone into decline, until by 1941 it had virtually stopped. In 1942 all offensive training at the Narshino Gas School was ended. In 1944 all stocks of gas were recalled by the Japanese High Command. US investigators reported that Japan had developed no gases other than those 'which had been known to the world for 20 years', they had used haphazard research methods, been given no help by the Germans, and that both offensively and defensively the country's supplies were 'inadequate for waging gas warfare on a modern scale'.[34]

At the end of the war, set against just 7,500 tons of Japanese poison gases, the Americans had 135,000 tons: 20,000 tons more than the combined total used by every nation fighting in the First World War.

Early in November 1943, First Lieutenant Howard D. Beckstrom of the US 701st Chemical Maintenance Company based at Baltimore received orders to prepare to go abroad. He was one of an élite group of chemical warfare experts. Trained at a special centre at Camp Sibert in Alabama, it was one of Beckstrom's jobs to supervise the movement of chemical munitions. His destination on this occasion, he was informed, was the main supply point for the Allied armies in Italy: the Adriatic port of Bari. His cargo was part of the vast American chemical stockpile: 100 tons of mustard gas.

Beckstrom's mission was not uncommon. Throughout the war, the British and Americans moved stocks of poison gas around the world, keeping large dumps close to the various fighting fronts. The Axis powers did the same. Each side shrouded the existence of these stocks in great secrecy for fear that the enemy would discover them and use them as a pretext to initiate chemical warfare. Thus when the British lost Singapore in 1942 the local commander was telegraphed by the War Office in London that it was 'essential no (repeat no) CW artillery ammunition or RAF equipment should fall into Japanese hands'.[35] Supply ships carrying gas bombs at or on their way to Singapore dumped their cargoes in the sea; stocks on land were burnt or thrown into nearby marshes.

Only the senior commander and a handful of his staff ever knew of the existence of gas stocks in his own particular area. It was this policy of strict secrecy which was to lead to the tragedy at Bari.

Beckstrom supervised the loading of the mustard gas at Baltimore onto the SS *John Harvey*, a 10,000 ton merchantman commanded by Captain Elvin Knowles, a veteran of the Murmansk convoys. In all the *John Harvey* carried 2,000 M47A1 100 lb chemical bombs. Just over four feet long and eight inches in diameter, each held 60–70 lb of mustard, enough to contaminate an area of forty square yards. With Beckstrom on the voyage were five other members of the Chemical Warfare Service. They had plenty to occupy them. American mustard gas was notoriously unstable, made by the cheap and speedy Levinstein H process. Each bomb contained 30 per cent impurities – gases which could build up and cause an explosion. The bombs had to be regularly vented, and the casings checked over for evidence of corrosion.

The *John Harvey* arrived at Bari from Sicily on 28 November. Captain Knowles found the harbour choked with Allied shipping.

Officially even he was not supposed to know the nature of the cargo he was carrying; it was therefore impossible for him to plead with the port authorities to give the unloading of his ship priority. Instead he was ordered to moor at Pier 29 to await his turn.

Four days later, early on the evening of 2 December 1943, the air raid sirens began to wail. That same afternoon, British Air Marshal Sir Arthur Coningham had called a press conference to announce what he considered to be the total Allied air supremacy over southern Italy. 'I would regard it,' he told the reporters, 'as a personal affront and insult if the Luftwaffe was to attempt any significant action in this area.'[36] Now, at 7.30 pm, one hundred Ju 88 German bombers roared in to inflict what proved to be the worst seaport disaster suffered by the Allies since Pearl Harbor.

The attack lasted for twenty minutes. At the end of it, seventeen ships carrying around 90,000 tons of supplies had sunk or were sinking; another eight were seriously damaged. Explosions ripped through the tightly-packed harbour, and shortly after eight o'clock a petrol ship blew up with such force it shattered windows in houses seven miles away. A few minutes later, a second explosion tore through the *John Harvey*. The ship listed and began to sink.

Some of the gas began to burn, some went straight to the bottom of the sea. The rest began to leak out of the ruptured hold and spread through the debris-filled harbour. It mingled with the hundreds of tons of oil floating on the surface to form a deadly mixture. Over the whole scene hung the characteristic odour of garlic – so strong that the men on one ship actually put on their respirators for half an hour. A dense black cloud of smoke mingled with gas began to roll across the harbour and over the town of Bari.

The men who were to be the worst casualties however were not those breathing in the fumes but those floating in the harbour, standing in puddles of oil in life boats, or hanging from life rafts: their entire bodies were being immersed in a lethal solution of mustard gas.

Neither the rescue squads operating at the port and in Bari's hospitals, nor the men themselves had any idea they had been exposed to mustard gas. No one knew what cargo the *John Harvey* had been carrying apart from Beckstrom and his men, and they had been killed along with Captain Knowles in a frantic attempt to scuttle the ship. The hospital was attempting to cope with 800 wounded men (more than 1,000 were already dead) and assumed

that most were suffering from nothing more serious than exposure. Still wet, covered in crude oil, they were wrapped in blankets and given warm tea. Most sat quietly in this state for the rest of the night while the mustard gas went silently to work. As a top secret report prepared for the Allied High Command put it two weeks later: 'The opportunity for burn and absorption must have been tremendous. The individuals, to all intents and purposes, were dipped into a solution of mustard-in-oil, and then wrapped in blankets, given warm tea, and allowed a prolonged period for absorption.'[37]

The morning after the disaster, the first of an estimated 630 mustard gas victims began to complain that they were blind. Panic swept through the hospital, and doctors had 'to force them to open their eyes to prove that vision was still possible'. Appalling burns started to develop, variously described as 'bronze, reddish brown or tan' which stripped the body of the top layers of skin. Some men lost 90 per cent of their entire skin covering. According to the report, 'the surface layers came loose in large strips' which 'often took the hair with them'. The burns were 'most severe and distressing in the genital region. The penis in some cases was swollen to three to four times its normal size, and the scrotum was greatly enlarged.' These burns were described as causing 'much mental anguish'. Out at sea, the US destroyer *Bistera*, which had picked up thirty casualties from the harbour at Bari before making her escape, was also in severe difficulties. By dawn the following morning her officers and crew were almost all totally blind, and many were badly burned. It was eighteen hours before they eventually landed in Taranto harbour.

While the *Bistera* was limping into port, the first casualties were beginning to die at the hospital in Bari. Within two weeks, seventy men were dead. Preliminary post mortems showed the classic signs of death from mustard gas: a badly burnt and blistered skin, lungs and respiratory tract stripped of their lining, a windpipe blocked with a solid column of mucous. The only difference was the severity of the symptoms. It was as if, under test conditions, the worst possible mustard gas burns had been deliberately produced. The bodies of forty 'representative' victims – made up of men from 'at least twelve nationalities or races' – were shipped to Porton Down and Edgewood Arsenal 'for microscopic examination and study'.

In the town itself there were similar scenes of misery. More than 1,000 civilians were killed at Bari – many of them as a result of the great cloud of mustard gas which billowed over the town, others

after being swamped in the oil-and-mustard tidal wave which engulfed the seafront. For weeks afterwards previously healthy townspeople lingered in their beds. For civilian and soldier alike it was a grim preview of what full-scale chemical warfare might entail.

As the confused details of the disaster reached Allied High Command there were successive waves of panic – first that the Germans themselves had initiated gas warfare, then, when preliminary investigations revealed that the havoc had been wrought by American gas, that the Germans would use it as an excuse to start an all-out chemical war. As the Allied armies were now on the offensive in Italy, and hoped soon to land on the French coast, it was likely that using gas would work greatly to Hitler's advantage. Churchill, informed of the situation by General Alexander, expressed 'his astonishment that a ship with such a cargo should have been sent to Bari'; he would, he said, await the result of an inquiry 'with the greatest interest'.[38]

At first General Eisenhower tried to keep the whole affair secret. The families of the men whose bodies were being dissected in England and America were informed that their son or husband had been killed by 'shock, haemorrhage, etc, due to enemy action'. For all record purposes, Eisenhower proposed to describe 'skin afflictions and burns' and 'injuries to eyes' as simply due to 'enemy action'; 'lung and other complications' were put down to bronchitis. He telegrammed the Combined Chiefs of Staff that he 'considered these terms will adequately support future claims by those injured for disability pensions'.[39] As a further security measure, complete postal censorship was imposed at every British and American military base. The policy of secrecy was approved by Roosevelt and the British War Cabinet.

Nevertheless it was soon apparent that Eisenhower had no chance of keeping what had happened at Bari a secret. Thousands of civilians had fled the town, spreading wild stories of deadly new weapons. Gas casualties had been unloaded at other ports suffering from undiagnosed wounds. By January, Allied hopes of secretly briefing commanders and doctors with details of what had happened had vanished in a welter of rumour and half-truth: 'It is believed that the knowledge is now so dispersed among divergent groups including civilian population in Bari area that no, repeat no, effective briefing can be accomplished'.[40] In February the Chiefs of Staff, after being told that news of the incident was likely to break at any

moment, prepared a statement along lines originally suggested by Eisenhower, reiterating that 'Allied policy is not (repeat not) to use gas unless or until the enemy does so first but that we are fully prepared to retaliate and do not deny the accident, which was a calculated risk'.[41]

A few months after the accident, the Allies directed their area commanders to inform their chief medical officers when stores of gas weapons were moved into their localities. In the meantime, the build-up of gas stocks in Italy continued, until there were sufficient chemical weapons stockpiled to enable the Allies to wage full-scale gas warfare in the Mediterranean for forty-five days.

Bari shows very clearly just how sensitive the issue of chemical warfare was among the Allied commanders. Although it rarely features in either official staff histories or personal recollections, thousands of hours were spent by the men who guided the course of the Second World War in discussing gas: when and if it should be used, what new developments there had been, what the other side's policy was, what weapons they had, how best to appear well-prepared for chemical attack without at the same time giving the impression that you were about to launch one. For a war which never was, it occupied much time and deep thought, as well as expertise, money and resources.[42]

This was particularly true in the aftermath of Bari and in the run up to D-Day. The Chief of the United States Chemical Warfare Service writing in 1946 calculated that the use of gas by the Germans against the Normandy beach-heads 'might have delayed our invasion for six months'.[43] That was a situation which the British in particular were anxious to avoid. They were unhappy with Roosevelt's open-ended pledge to embark on full-scale gas warfare if chemicals were used by Japan against China – for the sake of 'one Japanese soldier' using gas, the British Chiefs of Staff feared, the Americans might risk the success of the invasion of Europe. For similar reasons they opposed Eisenhower's ruling as Supreme Commander that white phosphorus could be used by the Allied Air Forces 'wherever it would assist operational plans in support of OVERLORD'. Normally used to provide a smoke screen, phosphorous could – like napalm – inflect appalling burns if it came into contact with the skin. According to the British this contravened the Geneva Protocol and they asked him to withdraw it from any situation in which it might be used as an anti-personnel weapon. Eisenhower,

pointing out that America was not bound by the Protocol, refused, and the British backed down.[44]

Allied anxiety about what the Germans might have waiting for them on the other side of the Channel even ran to the extent of fearing that the Nazis might have some sort of radio-active weapon.

This was not as improbable as it might sound. As a by-product of work on the atomic bomb the United States had researched into the feasibility of a 'radioactive gas'. 'Not even the best gas masks,' the Americans informed the British after the war, 'will give protection for long exposure.'[45] Work on radio-active gas was advanced enough for the subject to be brought to the attention of Eisenhower in the run-up to D-Day. General George C. Marshall, the US Chief of Staff, dispatched Major Arthur V. Peterson to SHAEF Headquarters to let Eisenhower into the secret of 'Tube Alloy'. On 11 May 1944 Eisenhower informed Marshall that he took the threat of German use of radio-active material seriously enough to have 'special equipment' . . . earmarked in the United Kingdom for dispatch to the Continent at very short notice.'[46] This mysterious 'special equipment' probably consisted of Geiger counters for measuring the existence of radio-active material. Eisenhower also told Marshall that 'medical channels have been informed as to the symptoms which would occur in these circumstances. This information has been sent out under suitable "cover" . . .'

The 'cover' Eisenhower devised was a circular to the leading medical authorities involved in OVERLORD warning of 'a mild disease of unknown etiology' which had supposedly already been reported. The symptoms the doctors were to look out for were fatigue, nausea, leukopenia (an excess of white cells in the blood) and erythema (reddening of the skin). The 'disease', the doctors were warned, tended to occur in groups: 'sporadic cases are very rare'. Should any cases of this unknown disease be discovered reports were to be forwarded at once to the Chief Surgeon.[47] The 'disease' was, of course, radiation sickness.

Eisenhower told Churchill of the American fear, and Churchill in his turn minuted Ismay: 'I wish Lord Cherwell to explain a certain matter to the Chiefs of Staff at the earliest opportunity, and then for the Chiefs of Staff to let me have their advice thereon. Let this be arranged.'[48]

Cherwell met the Chiefs of Staff on the morning of 19 May, and it was agreed

that the possibility of the enemy embarking on this form of warfare in the course of OVERLORD need not be taken seriously into account . . . The first twelve instruments [presumably Geiger counters] should be kept in store in Liverpool University . . . No Service personnel should be trained in the use of detectors, but a certain number of civilian physicists should be earmarked to operate the detectors in case of necessity. There is no need to let these physicists into the secret at present, as instruction in the use of these instruments would be a matter of only one or two days.[49]

There is no further reference to the mysterious 'disease' in the archives. D-Day passed without any use of gas – radio-active or otherwise – by the Germans, and Churchill and the Service Chiefs were quickly forced to turn their attention to more pressing matters.

Six days after the Normandy landings, late on the night of 12 June 1944, a strange stuttering mechanical scream was heard over the southern counties of England; suddenly the noise stopped, and there were a few seconds of silence; then there came a huge sheet of flame and the roar of an explosion. These frightening new weapons were 'CROSSBOW', the Allied code-name for Hitler's V-weapons. The offensive which had been so long predicted by the secret service had begun, and British civilians were once more back under attack.

Within two weeks the Germans had launched more than 2,000 V-1s against Britain. On 27 June the Home Secretary, Herbert Morrison, reported to the War Cabinet that 1,600 people had been killed and 4,500 seriously wounded; 200,000 homes had been damaged. Morrison warned of a 'serious deterioration' in civilian morale: 'considerable numbers of people were homeless. The attacks had led to serious loss of sleep and the fact that they went on continuously meant that there was no relaxation from the strain'.[50] The Germans were now dropping fifty tons of high explosive on London every day, and nearly 50 per cent of the British air effort was having to be diverted to try to shoot down the flying bombs before they reached the capital.

It was clear to the War Cabinet and the Chiefs of Staff that they had to retaliate – but how? On the night of 21 June Churchill ordered 2,500 bombers to attack Berlin in the heaviest air raid of the war so far. He also suggested that Britain might 'publish a list of, say, 100 smaller towns in Germany, where the defences were likely to be weak, and announce our intention of destroying them one by one by bombing attacks' unless Hitler called off the V-1 offensive. Then, on

4 July 1944, the British turned their attention to poison gas. The Chiefs of Staff called for a report from their think-tank, the Joint Planning Staff, on 'the desirability and practicability of using gas as a retaliation for CROSSBOW attacks. The report should consider the use of gas (a) against the CROSSBOW area alone (i.e. the launching sites), (b) as a general retaliation against Germany.'[51]

The JPS completed their report in twenty-four hours. They turned down the use of gas on purely military grounds:

> The use of gas, even employed continuously and in large quantities against these sites all of which have not yet been located, would not be likely to have more than a harassing effect . . .
>
> In our view, it would be impossible to confine the use of gas to attack against CROSSBOW installations and it would be likely that if we initiated it for this purpose, it would bring about the widespread use of gas in Europe.[52]

The JPS picked on three particular arguments against using gas: it would not stop the flying bomb attacks; general gas warfare would be to the disadvantage of the Allies, still precariously lodged in northern France; and the use of chemical weapons would require the prior agreement of the United States, Russia and the Dominion Governments. The Chiefs of Staff accepted the JPS's conclusions, and passed on to Churchill a firm recommendation against using gas.

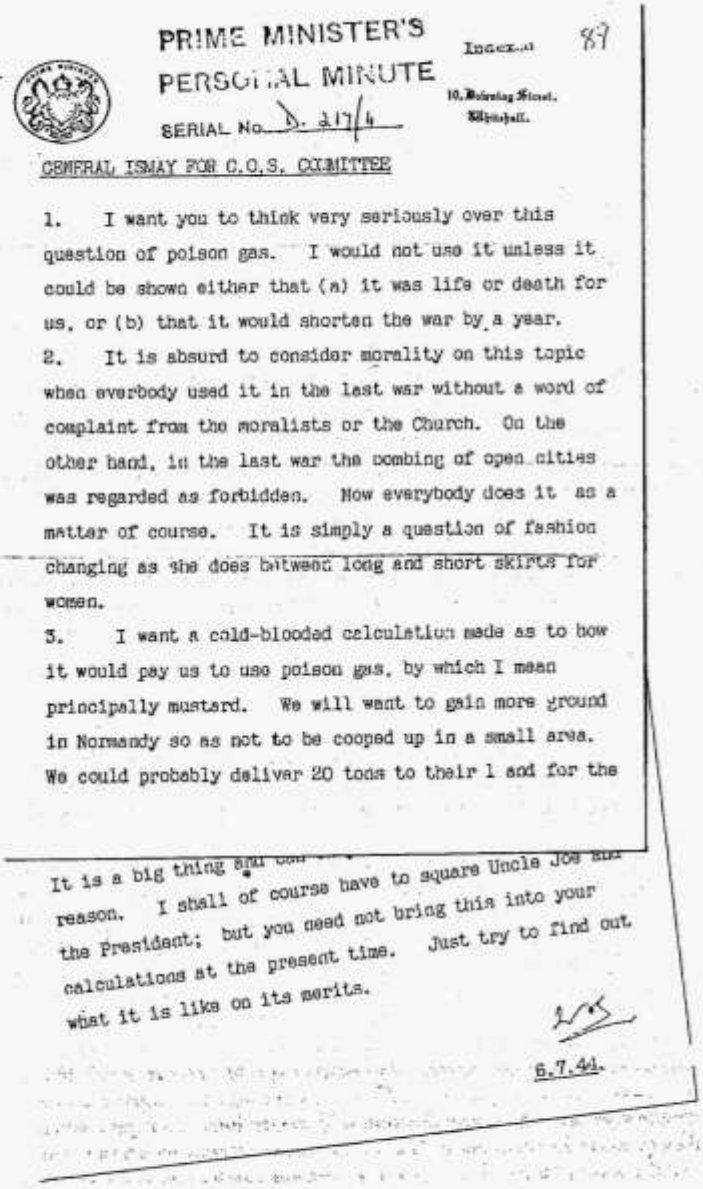
Churchill, however, was not so easily put off. In May 1942 he had publicly stated that the British were 'firmly resolved not to use this odious weapon unless it is first used by the Germans'.[53] Now his opinion had changed. The flying bomb attacks, indiscriminate in the suffering they bought to London, had enraged him, and fanned his hatred of Germany. The House of Commons might once more have to be evacuated; after months of relative peace, he and his military advisors had been forced back down into their underground bunkers. One bomb had landed in the very heart of the city, blowing up the Guards Chapel at Wellington Barracks in the middle of a Sunday morning service: eighty Guards officers, men and their relatives were killed and another 120 badly injured. Plans were drawn up to evacuate nearly one million people from London as a real sense of fear gripped the capital in a way it never had before, even in the darkest hours of 1940.

To add to the general panic, British Intelligence experts were now (erroneously as it turned out) predicting that the next German secret weapon, the V-2, might carry a warhead of ten tons. The Prime

Minister was haunted not only by his fear of what the Nazi rocket offensive might mean for London, but also by his recurrent nightmare that the Allied invasion of France might end in trench warfare and slaughter on the scale of 1916. On 6 July 1944 Churchill told the Commons that the flying bomb was a weapon 'literally and essentially indiscriminate in its nature, purpose and effect. The introduction by the Germans of such a weapon obviously raises some grave questions upon which I do not propose to trench today.'[54]

Dissatisfied with the first JPS report on gas warfare he set his heart upon another. On 6 July – the same day that he spoke of 'grave questions' in the House of Commons, and the day after the Chiefs of Staff recommended against using gas – he fired off an outspoken memorandum to the service chiefs. It must rank as one of the most extraordinary papers he ever wrote, and is worth quoting in full:

> I want you to think very seriously over this question of using poison gas. I would not use it unless it could be shown either that (a) it was life or death for us, or (b) that it would shorten the war by a year.
>
> It is absurd to consider morality on this topic when everybody used it in the last war without a word of complaint from the moralists or the Church. On the other hand, in the last war the bombing of open cities was regarded as forbidden. Now everybody does it as a matter of course. It is simply a question of fashion changing as she does between long and short skirts for women.
>
> I want a cold-blooded calculation made as to how it would pay us to use poison gas, by which I mean principally mustard. We will want to gain more ground in Normandy so as not to be cooped up in a small area. We could probably deliver twenty tons to their one and for the sake of their one they would bring their bomber aircraft into the area against our superiority, thus paying a heavy toll.
>
> Why have the Germans not used it? Not certainly out of moral scruples or affection for us. They have not used it because it does not pay them. The greatest temptation ever offered to them was the beaches of Normandy. This they could have drenched with gas greatly to the hindrance of our troops. That they thought about it is certain and that they prepared against our use of gas is also certain. But the only reason they have not used it against us is that they fear the retaliation. What is to their detriment is to our advantage.
>
> Although one sees how unpleasant it is to receive poison gas attacks, from which nearly everyone recovers, it is useless to protest that an equal amount of HE will not inflict greater cruelties and sufferings on troops or civilians. One really must not be bound within silly conventions of the mind whether they be those that ruled in the last war or those in reverse which rule in this.
>
> If the bombardment of London really became a serious nuisance and great



PRIME MINISTER'S PERSONAL MINUTE

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SERIAL No. D. 217/4

CENTRAL ISMAY FOR C.O.S. COMMITTEE

1. I want you to think very seriously over this question of poison gas. I would not use it unless it could be shown either that (a) it was life or death for us, or (b) that it would shorten the war by a year.

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It is a big thing and [illegible] reason. I shall of course have to square Uncle Joe and the President; but you need not bring this into your calculations at the present time. Just try to find out what it is like on its merits.

6.7.44.

rockets with far-reaching and devastating effect fall on many centres of Government and labour, I should be prepared to do *anything* [Churchill's emphasis] that would hit the enemy in a murderous place. I may certainly have to ask you to support me in using poison gas. We could drench the cities of the Ruhr and many other cities in Germany in such a way that most of the population would be requiring constant medical attention. We could stop all work at the flying bomb starting points. I do not see why we should always have all the disadvantages of being the gentleman while they have all the advantages of being the cad. There are times when this may be so but not now.

I quite agree it may be several weeks or even months before I shall ask you to drench Germany with poison gas, and if we do it, let us do it one hundred per cent. In the meanwhile, I want the matter studied in cold blood by sensible people and not by that particular set of psalm-singing uniformed defeatists which one runs across now here now there. Pray address yourself to this. It is a big thing and can only be discarded for a big reason. I shall of course have to square Uncle Joe and the President, but you need not bring this into your calculations at the present time. Just try to find out what it is like on its merits.[55]

Forty-eight hours later, the Chiefs of Staff met to discuss Churchill's dramatic proposal. Sir Charles Portal, Chief of the Air Staff, was sceptical: according to the minutes of the meeting, 'he was not convinced that the use of gas would produce the results suggested in the Prime Minister's minute. It was very difficult to achieve a heavy concentration of gas over a large area.'[56]

There was however one weapon which could possibly overcome this problem: anthrax.

In June 1944 the whole biological warfare programme had come under the control of the Chiefs of Staff. Now, in a minute circulated by the Secretary to the committee, it was pointed out that germ weapons had left the research stage and were in production. After some discussion the Chiefs of Staff

requested the Vice Chiefs of Staff to carry out a comprehensive examination of the points raised in the Prime Minister's minute, and to include in their examination consideration of the possibilities of biological warfare and of the form which enemy reprisals might take.

The Vice Chiefs of Staff passed the matter on to the Joint Planning Staff. The planners' instructions were clear:

The Prime Minister has directed that a comprehensive examination should be undertaken of the military implications of our deciding on an all-out use

of gas, principally mustard gas, *or any other method of warfare which we have hitherto refrained from using against the Germans* [authors' italics] in the following circumstances:
(a) As a counter-offensive in the event of the use by the enemy of flying bombs and/or giant rockets developing into a serious threat to our ability to prosecute the war;
or, alternatively,
(b) as a means of shortening the war or of bringing to an end a situation in which there was a danger of stalemate.

The Chiefs of Staff have instructed the Joint Planning Staff to carry out this examination, which should cover the possibilities of the use of biological warfare by us or by the enemy. It should take the form of a thorough and practical examination of the military factors involved and should ignore ethical and political considerations.[57]

These orders were issued on 16 July, ten days after Churchill's initial minute about the use of gas. In the intervening period the Prime Minister had himself apparently broadened the terms of the inquiry to embrace the use of 'any other method of warfare' apart from gas hitherto not used against the Germans. The Chiefs of Staff had independently asked for the inclusion of germ weapons. With the backing of the two most powerful authorities in the country – 10 Downing Street and the Service Chiefs – the stage was now set for a sweeping re-examination of Britain's commitment to the Geneva Protocol. The JPS were specifically asked to consider 'an unrestricted use of chemical and biological weapons'. So secret was their task that they were instructed only to consult *British* military personnel and scientists: the Americans were not to be informed of the policy review.

While the JPS worked on their report, Churchill fumed at the delay. On 25 July he wrote the Chiefs of Staff a curt reminder:

On July 6 I asked for a dispassionate report on the military aspects of threatening to use lethal and corrosive gases on the enemy if they did not stop the use of indiscriminate weapons.
I now request this report within three days.[58]

Late on the evening of the 27th, at a meeting of the War Cabinet, a copy of the long-awaited JPS report[59] was handed to the Prime Minister. Fourteen pages long, it was a complete and chilling review of the precise ways in which using chemical and biological weapons would affect the course of the war.

British and American stocks of gas in the United Kingdom were

described as sufficient 'to produce a formidable scale of gas attack on Germany'. Production of gas was sufficient to enable 'a continuous effort by 20 per cent of Bomber Command', but if chemical warfare was initiated, the JPS recommended against a 'continuous effort' and in favour of a massive hammer blow, using the combined strength of the entire British and American bomber force. 25 per cent of the payload would be high explosives, to shatter buildings and spread panic; after that would come the main force, carrying gas bombs.

Phosgene would be dropped 'on the scale of 16 tons per square mile' either against 1,000 tactical targets, or against twenty German cities. The result would be 'heavy casualties amounting to 5–10 per cent deaths of civilians and civil defence personnel'. Mustard gas would be used to attack 1,500 tactical targets, or alternatively sixty cities.

In the large-scale gas attacks on cities, vapour burns would be caused on such a scale as to necessitate wholesale evacuation, thus paving the way to a subsequent incendiary attack. Speedy wholesale evacuation might well be a physical impossibility, in which case large casualties would follow . . .
The initial effect of using chemical warfare against large centres of population in Germany would be to produce great confusion, probably amounting to panic in the areas immediately concerned.

In an appendix, the report's authors included a list of sixty German cities which would be 'favourable targets' in an attack 'calculated to bring about a collapse of German morale'.[60]

The JPS also considered the likely effect of gas warfare on the various theatres of the war. In France:

. . . the first tactical use of gas by us, assuming surprise was obtained, might provide a chance of obtaining decisive local results, thereby enabling us to break through the German defences on a large scale.
On the other hand, if operations in Normandy progress favourably and achieve a degree of fluidity, it would be against the Allied interest to employ gas . . .
Gas on the unprotected populations in the battle area would hamper military operations and unsettle labour. It might seriously impair our relations with the civilian population when it became generally known that chemical warfare was first employed by us.

In the East, in southern France and in the Mediterranean, initiating gas warfare was considered likely to backfire on the Allies by slowing up their advance. In the Balkans 'the use of gas would be likely to

deprive us of the active assistance of the Partisans, who are ill prepared for chemical warfare, and of the sympathetic support of civilians whose unhelpful attitude to the enemy at the present time is of value to us.' With regard to Japan there were similar strong military arguments against using gas, particularly as 'during the course of the war against Japan it will probably be necessary to undertake major amphibious assaults of critical importance'. Allied soldiers 'with families at home exposed to gas would be worried and depressed'.

The JPS were in no doubt that 'if the Allies initiated chemical warfare the Germans would immediately retaliate both in the field and against the United Kingdom'. London would be the primary target and could expect to be attacked by flying bombs filled with gas and by up to 120 long range bombers carrying chemical payloads. Repair work to damaged buildings would be slowed up, there would have to be evacuation, and – if phosgene was used – casualties would exceed those inflicted by high explosives 'by a large margin'.

The effect of the use by the enemy of gas on the morale of the British population is difficult to judge. The Ministry of Information reports on morale on the Home Front suggest that when the flying bomb attacks began, some elements of the population were particularly apprehensive lest the bombs should be filled with gas. After nearly five years of war and five weeks' experience of the flying bomb, public morale in the areas affected is less resilient, and might react unfavourably at first if gas were now used, although the shock would diminish as the efficacy of the protective and remedial measures became apparent. The public at large might, however, be resentful of being subjected to gas attack if it felt that this could have been avoided . . .

We believe that the Germans might retaliate on Allied prisoners of war, possibly by forcing them to work in contaminated areas. This would undoubtedly cause great concern to the public at large.

Taking all the factors together, the JPS advised against using chemical weapons. But they put biological warfare in a different category.

For the first and very probably the only time in the war, the use of germ weapons against German cities was contemplated. There is never any mention of the disease under consideration – anthrax – which is referred to throughout the report by its code-name, 'N'.

'N' is the only Allied biological agent which could probably make a material

change in the war situation before the end of 1945. There are indications which lack final scientific proof, that the 4-lb bomb charged with 'N' used on a large scale from aircraft might have a major effect on the course of the war.

The 4-lb bombs were loaded, 106 at a time, into 500-lb aircraft cluster bombs. Twenty cluster bombs were regarded as enough to knock out a flying bomb site, 1,000 would contaminate a 'small island', 2,000 a 'large town' of twenty-five square miles. Both the British and the German civilian populations were defenceless against anthrax to which there was 'no known prophylactic measure'.

There seems to be little doubt that the use of Biological warfare would cause heavy casualties, panic and confusion in the areas affected. It might lead to a breakdown in administration with a consequent decisive influence on the outcome of the war.

Whereas chemical warfare was ruled out, JPS did not advance a single military or political argument against dropping anthrax on German cities. The US production programme, however, was stated to be 'behind schedule'. It now seemed unlikely that Britain would have all the quarter of a million anthrax bombs she was expecting by the end of 1944 (the first half of the order Churchill placed with the Americans in the spring: see Chapter Four).

If extreme pressure were applied to the US authorities enough 'N' bombs might be accumulated towards the end of this year for a very few significant token or demonstration attacks to be made on selected objectives, but there is no likelihood of a sustained attack being possible much before the middle of 1945.

The JPS ruled out the use of biological weapons solely on the grounds of time. If the Allied programme had been a year further advanced they might well have come to a different conclusion.

Churchill received a copy of the JPS report on the night of 27 July. On the morning of 28 July the Chiefs of Staff met and approved its contents. They were firmly against the use of poison gas and germ weapons and they added a further significant criticism:

It is true that we could drench the big German cities with an immeasurably greater weight of gas than the Germans could put down on this country. Other things being equal, this would lead to the conclusion that it would be to our advantage to use the gas weapon. But other things are not equal. There is no reason to believe that the German authorities would have any greater difficulty in holding down the cowed German population, if they

were subjected to gas attack, than they have had during the past months of intensive high explosive and incendiary bombings.

The same cannot be said for our own people, who are in no such inarticulate condition.[61]

On the 29th, Churchill – who is said also to have received strong representations from Eisenhower against unleashing gas and germ warfare – acknowledged defeat.

I am not at all convinced by this negative report. But clearly I cannot make head against the parsons and the warriors at the same time.

The matter should be kept under review and brought up again when things get worse.[62]

Things did not get worse. The menace of the V-weapons was contained, and the Allied position in Normandy grew stronger; the threat of deadlocked trench warfare, bleeding away millions of lives, which so haunted Churchill, was averted. The Allies were able to finish the war with the promise they made to abide by the Geneva Protocol intact.

It had been a near thing. Although Churchill's idea of using gas seems to have attracted no support whatsoever among the Allied military commanders, the weapon was to hand, and had the war developed differently, the policy might well have changed. Several squadrons of Bomber Command are said to have been given special training in dropping gas bombs in 1944.[63]

And what of biological warfare? None of the arguments which eventually convinced the Chiefs of Staff that gas should not be used applied in the case of anthrax: indeed it was the Service Chiefs, in the knowledge of its destructive power, who had asked for its inclusion in the JPS report in the first place. If its development had been a year further advanced might it not have been used in the summer of 1944? Or, alternatively, could it not have been used at some later date when there were sufficient stocks and if Germany had been able to prolong the war into 1946? At some point presumably the 'ethical and political considerations' deliberately ignored by the JPS and the Chiefs of Staff would have been discussed. When, a year later, a weapon comparable to biological warfare – the atomic bomb – was actually in existence, and offered a chance to shorten the war, the Americans used it. Why, from an ethical or political point of view, should germ warfare have been regarded any differently?

Considering, then, that anthrax might have been used – a weapon

of mass destruction with an ability to contaminate terrain almost as great as modern nuclear weapons – the Germans were perhaps fortunate to collapse as quickly as they did. By February 1945, the British were sufficiently convinced that the end of the war was near to wind up all production of poison gas: the Chiefs of Staff asked for permission to discontinue production and discharge the munition workers. It was left to Churchill, the man who had done more than any other to develop the poison gas programme, and who had come close to using it, to issue the necessary order: 'So proceed. The personnel should be thanked. W.S.C. 1.3.45.'[64]

The world missed chemical warfare in the Second World War by inches. It is said, for example, that only the personal intervention of President Roosevelt prevented gas being used against Japan in the closing stages of the war.[65] The so-called 'Lethbridge Report' drawn up for the American High Command recommended soaking the island of Iwo Jima with poison gas in 1944. They concluded that 'the employment of chemical warfare with complete ruthlessness and upon a vast scale' would have a decisive result against the Japanese.[66] The report was approved by the Combined Chiefs of Staff and by Admiral Chester Nimitz, the theatre commander, but when the plan went to the White House it was returned with the comment, 'All prior endorsements denied – Franklin D. Roosevelt, Commander in Chief.' (The Americans went on to suffer 20,000 casualties in their struggle to capture the heavily-defended island.) After Roosevelt's death, the development of the atomic bomb meant that plans to use gas in support of an invasion of the Japanese mainland could be shelved.

From the first year of the war to the last, there was a substantial risk that chemical weapons would be used. The British would certainly have used them against a German invasion. The Russians feared the Nazis would use them on the Eastern Front, and Churchill offered to send Stalin 1,000 tons of mustard gas for retaliation.[67] The German Foreign Minister, Ribbentrop, threatened the Italians with gas attacks if they deserted the Axis cause.[68] According to one report, Göring, under interrogation at Nuremburg, stated that the Nazis did not use nerve gas against the D-Day landings, becaused they feared gas retaliation which would have paralysed the Wehrmacht's transportation system, still heavily dependent on horses.[69] And the British and the Americans both evaluated the benefits of using gas in the closing stages of the war.

At no point was the fact that chemical weapons were banned under international law a major consideration in the decision not to go ahead and use them (except possibly in the personal antipathy of Roosevelt – ironically one of the few countries free from legal obligation not to use gas was led by one of the few world leaders with a moral aversion to the weapon).

Gas was not used because at any given stage in the war there were sufficient military disincentives to stay the hand of the belligerent who reached for the gas weapon. Hitler wanted peace in 1940 more than he wanted to wipe out the men at Dunkirk; by the time he did want to use gas, in 1944, he no longer had the bomber force left to deliver it. The British might have used gas in France in 1940 to halt the *Blitzkrieg* if they had had the stocks; by the time they had the poison gas and the bomber force in 1944 they were on the offensive and would have been slowed down by chemical warfare.

It is impossible to draw any lesson for the future from the non-use of gas in the Second World War – or, indeed, any hope. It was nearly used, but wasn't, because of the precise military circumstances prevailing at the time. These were short-term, and unlikely to be repeated. In 1945 this was appreciated on all sides, and there was no move for chemical disarmament, as there had been after the First World War. The British and the Americans viewed the future of chemical and biological warfare with increasing trepidation. For a new and unknown factor now had to be included in any calculations of military policy in the future: Russia.

SIX
New Enemies

Gas, with the tank and the aeroplane, was one of the most significant developments of the last war, but alone among these three has not been used in this war. The principal reason seems to have been that the power militarily ascendent at various times either had scruples against using gas or believed that his military ends could be best achieved without resort to it . . . We cannot be certain that in a future war an attacking power will be governed by similar scruples or conditions. Indeed, the emphasis on 'Blitzkrieg' (which any aggressor would certainly attempt) would encourage him to employ every means to achieve his end with speed and decision.

Third draft of the Tizard Report, February 1945

At the end of the war British sailors loaded twenty elderly merchant vessels with captured German gas shells, and sailed them into the Baltic. Off the coast of Norway they donned gas masks, placed explosive charges aboard, and then watched as, one by one, the ships exploded, taking tens of thousands of tons of gas to the seabed. From bases in Scotland, one hundred thousand tons of British gas weapons were taken out to sea and sunk. In the Far East American sailors sank captured Japanese weapons in the Pacific. Mustard gas stocks which had fallen to the advancing Russian armies were tossed into the Baltic in wooden crates while machine gunners opened fire and sent them to the bottom of the sea.[1]

But despite these well publicized attempts to renounce gas – a weapon which had, after all not been used during the Second World War – the allies were already beginning to argue among themselves over who should possess the secrets of the Nazi nerve agents. It was inevitable that the advancing allied armies would come across nerve gas arsenals, and, in due course, upon the very factories where the stuff was produced.

The British were in no doubt about what should be done with the stocks of German chemical weapons which fell to their forces. Most would be destroyed, but some supplies of mustard gas and nerve