CHAPTER 1

ADVENT OF THE ATOMIC AGE AND ITS IMPLICATIONS

It seems incredible that the development of atomic bombs and massive release of atomic energy could have been foreseen more than seventy years ago. H.G.Wells in his book, THE WORLD SET FREE,\(^1\) published in 1914, forecast that artificial radio-activity would be discovered in 1933, as indeed, it was, by the French nuclear scientist Joliot Curie. The prophetic forecast, incredibly again also mentioned a nuclear world war in which the major cities of the world would be destroyed.\(^2\)

The chain of events that led to the creation of the atom bomb had begun in early thirties. Experiments had been going on in the Kaiser Wilhelm Institute of Berlin to transform the atomic structure of atom. In the United States and on the continent, the scientists were bombarding a variety of natural elements with streams of neutrons. In the winter of 1938, two German scientists, Otto Hahn and Fritz Strassmann, succeeded in splitting the nucleus of an atom. This was an epoch making discovery which changed the course of events. The outbreak of war in 1939, galvanised the situation. Physicists in the United States soon learnt of the experiments, demonstrating the possibility of nuclear fission and were not only enthralled but filled with a sense of awe and urgency to overtake Germany, lest she

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\(^2\) Ibid., pp. 92-103.
should succeed in making the atom bomb first and decide the outcome of war. This led to the eventual establishment in the United States of the Manhattan Project designed to undertake the development of a nuclear weapon. President Roosevelt agreed to spend two billion dollars on the bomb project primarily because Germany, he was sure, was on its way to making one.

In 1939, scientists had demonstrated that Uranium which is almost entirely U 238 was the crucial material; also that U 235 which is fissionable was available in uranium only in microscopic quantities. The initial problem thus was U 235. With all the separation plants in the United States of America operated by tens of thousands of people being now engaged on the separation of U 235, only microscopic quantities were dripping forth. Trials with conventional methods of assembly also met initially with failure but the difficulties encountered would be finally overcome.

The Hungarian refugee physicist Szilard had conceived in 1933, the possibility of a chain reaction. In December 1942, when the atomic pile at the University of Chicago was poked and prodded to reveal whether the neutron was really the key to the bomb, the galaxy of scientists watched, with bated breath, the meters which would measure the neutron emission inside the pile. After several hours the meters went crazy. "The reaction is self sustaining" exclaimed Enricho Fermi, calmly ushering in the Nuclear Age and "This day", exclaimed Szilard, "Will go down as a black day in the history of mankind".1

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In the meantime Japan had declared that it would go to war and on December 8, 1941, its planes had swooped down on the U.S. Pacific Fleet in Pearl Harbour. In a little more than an hour and forty five minutes, the Japanese had destroyed 188 planes and damaged 159 others and had sunk or seriously damaged 18 ships of war, including the Arizona and Oklahoma. In all, the United States suffered heavy losses, with 2403 killed and 1178 wounded. Japanese lost 29 planes and pilots, five midget sub marines and one big sub marine.\(^1\) The attack instantly unified the American people and brought a vengeful United States into the war. The Manhattan Project assumed greater urgency. The army was brought into the production plant, construction activities and things started moving apace. Robert Oppenheimer joined the Project in June 1942 as the Director of Project Y—the group that was to design the actual weapon. A site was chosen for setting up a laboratory at Los Alamos Ranch School in New Mexico, where trials with conventional methods of assembly met with failure, until 1943 when the implosion technique was evolved. The way in which the bomb would work was simple enough: what was envisaged was the provision of a common barrel inside the bomb's casing which would fire a projectile containing a sub critical mass of U 235 into another sub critical mass of U 235 in front of the muzzle. Since the two sub critical masses, on contact, would become the critical mass, a nuclear explosion would occur.

By 1945, when MANHATTAN PROJECT appeared to be nearing its objective, President Roosevelt died. However, in September 1944, he had already signed with Churchill a secret aide-memoire agreeing that when a bomb is finally available, it might perhaps, after mature consideration, be used against the Japanese.

Truman who succeeded Roosevelt was promptly briefed about the status of the project and informed that by July 1945 enough uranium 235 would have been collected for an implosion assembly test. The support construction, he was informed, was underway at Tinian on the Mariana Islands 1500 miles south of Japan. The stage was thus set not only for the first test but also for the eventual bombing of Japan, for which purpose several B 29 planes were suitably modified to carry the weapon.

Germany surrendered unconditionally on May 8, 1945 and the second world war came to an end in the European theatre. Roosevelt, it has been noted, had agreed to spend two billion dollars on the bomb project for the reason that Germany was building one. Now the great irony was that Germany was not only out of the war, but, as it came to be known, had not seriously tried to produce the weapon!

The allies now turned their entire attention to Japan. Japan's war effort had already started crumbling under massive external and internal pressures and morale had plummeted. The air force had ceased training for lack of gas or oil. Ship builders turned out wooden

1. President Roosevelt died on April 12, 1945.
ships for lack of steel. Heavy aerial attacks had been launched on targets in Japan by the 20th Air Force based in Marianas. The aerial attack launched at night on March 9, 1945, had used napalm fire bombs on the highly inflammable buildings of Tokyo. The target area was a congested part of the city where nearly all the buildings were of flimsy wood and plaster construction. To enable the planes to carry heavier bomb loads they were stripped of their guns and as they flew at low altitudes they carried less gasoline. The results achieved exceeded all expectations. Raging fires during the night of March 9-10 had destroyed about one fourth of all the buildings in the city, with more than 80,000 persons (according to some accounts more than 1,00,000) having died in the holocaust and 10,00,000 having been rendered homeless. The U.S. naval forces were cruising the Japanese territorial waters with impunity and with Japan's ties with the outside world being completely severed there was no prospect of any help or succour from any quarter.

Even so Japan which was dominated by the militarists, gave no indication that it would capitulate. The militarists continued to count on the tenacity of the Japanese which stemmed from their rigid code of honour, and from their concern for the Emperor. A Japanese General had boasted: "The Imperial Army is confident. Our men are fortified with the admirable spirit of Kami Kaze".

Despite the bragging of the militarists and the unbounded tenacity of the Japanese people, there were saner elements (including the Emperor) who wanted a

quick end of the war. In 1945, a Japanese scientist had been asked to make a secret study of Japan's ability to continue the war. The study reported that Japan could not continue the war, there was not enough steel for ships, not enough aluminium for planes, not enough coal for munitions, not enough fuel for the transportation system, and not enough food for the people, who were beginning to turn against the war as their cities lay demolished by the bombs. However, an unconditional surrender was still not on the cards.

The site chosen for testing the bomb, after careful deliberation, was in the heart of the Alamogordo Bombing Range about 200 miles south of Los Alamos. By a strange coincidence the desert chosen for the first test was known as Jornada Del Muerto (Journey of Death) to the early Spanish explorers.

On July 15, 1945, on top of a 100 ft. steel tower at Trinity the "Fat man" as the Bomb was nicknamed, lay waiting, sheltered under a steel roof. The test explosion was scheduled for 5.30 A.M. of July 26. The count down began at 5.10. Many witnesses struggled for words to describe what followed the call of Zero. The New York Times reporter wrote "Time stood still. Space contracted to a pin point. It was as though the earth had opened and the skies split. One felt as though he had been privileged to witness the birth of the world." The full significance of the explosion was realised by Oppenheimer who stunned by the blast is said to have recalled the ominous verse from the Bhagvat Gita.

If the radiance of a thousand suns were to burst into the sky, that would be like the splendour of the Mighty One. I am become Death, the shatterer of the Worlds".

1. For details see Dan Kurzman, op. cit., p.241.
The explosion came as a flash of lightning, illuminating mountains 10 miles away. It created a wave of intense heat and later a tremendous roar as the shock waves passed and echoed. A ball of fire rose rapidly followed by a mushroom cloud extending to 40,000 ft. The steel tower on top of which the "Fat man" was exploded was completely vaporised and the surrounding desert surface fused to glass for a radius of 800 yards. The theorists' predictions of the energy release, had ranged from the equivalent of 1000 tons of TNT to an optimistic 5000 tons. Instead the test produced an energy equivalent to 20,000 tons.\(^1\) The incredible light was seen by agents, as far as in, Albuquerque and Santa Fe, who wondered if anybody had survived in the vicinity. Tremors were felt hundreds of miles away. Civilians thought that the Japanese had invaded or a national disaster like an earth quake or a meteor crash had occurred. A woman on the Arizona border reported that the sun had risen twice that day—once very quickly. This was the test explosion code named Trinity. In Hindu philosophy Trinity stands for the oneness of Name, Form and Thought. Thought being the finest part of the Universe, the real motive power, symbolises God.\(^2\) This Trinity was, however, a combination of Death, Destruction and Doom.

Upto the test explosion, all plans were focussed on an assault upon Japan by air bombing and by invasion with the help of very large armies. The estimates of casualties from such an invasion were appalling. As many as one million Americans and half a million British (if Churchill could convince Truman to let the British join in for the kill), and at least a million Japanese would be

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killed or wounded, apart from all the misery and devastation, which an attack would entail.\(^1\) Even so most of the American military leaders considered that an invasion of Japan was an inevitable though a painful necessity and that the allies should be prepared and willing to pay the price involved. But the Manhattan Project culminating in the test explosion on July 16, 1945, had produced, as though by a magic wand, the possibility of a simpler and cheaper alternative. Now there appeared on the horizon the vision, both fair and bright, of the end of the whole war, in one or two violent shocks.

More by design than by coincidence, the Potsdam Conference (July 24, 1945) synchronised with the test explosion. The Soviet, the U.S. and the British heads of government and foreign ministers had already arrived in Potsdam when the news of the test explosion was flashed to Truman who while hoping for some sort of a future peace, expressed the fear that "machines are ahead of morals by some centuries and when morals catch up there will be no reason for any of it".\(^2\) Churchill was completely carried away with the news and according to his British Chief of Staff, Field Marshal Lord Alanbrooke, he was overwhelmed and started seeing himself capable of eliminating all the Russian centres of industry and population.\(^3\) The news was, however, kept back from Stalin until July 24, when Truman casually mentioned to Stalin that the United States now had a new

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1. Conflicting accounts have been given. For details see Dan Kurzman, op. cit., p.267.
2. Truman's Diary made up of miscellaneous scraps of paper, kept during the Potsdam Conference, Truman Library, quoted by Dan Kurzman, op. cit., p. 363.
weapon of unusual destructive force. The Russian Premier showed no special interest, merely expressing the hope that the United States would make good use of it against the Japanese.¹

Japan, despite the diehard attitude of its military leaders, was pursuing its efforts for some sort of a peace mediation by Russia such as would reconcile its national pride. American intelligence analysts had concluded in a report on July 26, following a study of the messages which were being exchanged between Foreign Minister Togo in Tokyo and his Ambassador Sato in Moscow, that Japan now, officially, if not publicly, recognised her defeat and was trying to find the best means of salvaging the wreckage of her ambitions. Stalin read to the Conference, Sato's second request for Russian peace mediation but the view which prevailed was that Stalin should continue to "lull the Japanese to sleep".

On July 25, 1945 the Potsdam Proclamation was signed by the United States, China and the United Kingdom.² The Soviet Union seems to have been deliberately kept out, ostensibly because it was not at war with Japan, with the United States pretending later, (after the release of the Proclamation) that they did not want to embarrass the Russians by showing it to them. Russia's signature would, it was thought, quash Japan's last hope for a Russian-mediated peace and perhaps be another way of inducing a swift surrender. But Truman and his secretary of State Byrnes would have none of it, because it made no sense to give the Russian leader a chance to claim chunks of the Far East. His signature might simply achieve what a Russian invasion

¹. The details of the bomb had already been supplied to Stalin by a Russian spy Klaus Fuchs closely associated with the Manhattan Project.
². For the text of the Proclamation see Appendix 1A.
would turn a two billion dollar bomb into a useless relic that could no longer shock him into renouncing his campaign to paint the map red. Stalin had in any case planned to send his troops into Manchuria by mid August. The question therefore was, why could not the United States wait for just a few days to see if the Russian invasion would trigger a Japanese surrender, and thus obviate the need for using the bomb and thereby avoid all the wanton destruction which such use was found to entail? It was believed, or so the Americans and the British claimed, that the world would be better off if Japan surrendered to a peace loving United States which did not covet territory than to an aggressive Russia which did. The idea, they argued, was not simply to end the war expeditiously but to end it in a way that would save the world from Russian domination.

The Potsdam Proclamation declared that the time had come for "Japan to decide whether she will continue to be controlled by those self-willed militaristic advisers whose unintelligent calculations have brought the Empire of Japan to the threshold of annihilation, or whether she will follow the path of reason". It called for the unconditional surrender of all the Japanese armed forces, failing which Japan was threatened with prompt and utter destruction. The signatories also declared, no doubt with a certain amount of concealed sarcasm, that there was no intention to enslave the Japanese as a race or destroy them as a nation, but "stern justice shall be meted out to all war criminals, including those who have visited cruelties upon our prisoners"; and also that "freedom of speech, of
religion and of thought, as well as respect for the fundamental human rights shall be established". While the Proclamation promised that "the occupying forces of the Allies shall be withdrawn from Japan as soon as these objectives have been accomplished", it was silent about one matter which was of vital concern to Japan, namely, the status of the Emperor: neither did it specifically state the nature of the "prompt and utter destruction" which would befall Japan if it did not surrender unconditionally. The "atomic bomb" was not mentioned so that the Japanese would think that it would be more of the same conventional bombs that would be used. However, last minute efforts were still made to deflect the policy makers from using the bomb. The Proclamation, no doubt, could not be changed, but the optimists hoped that if Truman could still reassure the Japanese, even verbally through diplomatic channels, that the Imperial dynasty will survive, the assurance might prove to be just the thing which would induce them to accept surrender and escape the holocaust which loomed on the horizon.

1. See the Text of the Potsdam Proclamation, Appendix 1A Clauses (10), (12) and (13).
2. For details see Dan Kurzman, op. cit., pp. 390-392. Szilard made last minute efforts to pierce the conscience of the President. Though he was convinced that the bomb should not be dropped under any circumstances, he had to make some changes in the appeal he forwarded to the President. Even after the compromise he made, he could get only sixty nine signatures, just sixteen more than the original petition had drawn. Oppenheimer also a critic of the decision believed that it was a foregone conclusion. See Barton J. Bernstein, "Shatterer of Worlds Hiroshima and Nagasaki", BULLETIN OF THE ATOMIC SCIENTISTS, Vol. 31(10), 1975, pp. 12-21.
In Japan, as anticipated, there was no realisation that an atom bomb had indeed been produced. The army was in no mood to accept the ultimatum, the unsettled question of the Emperor's status providing a convenient excuse for its intransigence. The eventual response was, however, not entirely unequivocal when Prime Minister Suzuki declared at the press conference on July 27, 1945, obviously with mental reservations, that the joint declaration by the three powers was nothing but a repetition of past declarations and that what the Government had to do was to "Mokusatsu" it. "Mokusatsu" meant many things: "no comment", "ignore", "take no notice of", "treat with silent contempt". It did not mean "reject" but it did not mean "accept" either. After the press conference, however, the war minister Anami told the Information Board which cleared all news that what Suzuki meant by "Mokusatsu" was "reject by ignoring" and the Head of the Information Board went on the radio and explained this. And the response was taken as rejection of the Potsdam Proclamation. The way was now clear for unleashing the dreaded weapon on women, children and unarmed people without any qualms of conscience or a feeling of remorse.

Preparations for dropping the bomb on Japan had already been afoot and were fairly well advanced. The "Little Boy" as the bomb intended to be dropped on Japan was nicknamed, had sailed for Tinian, a South Pacific Island, on July 14, where the scientists put the pieces of "Little Boy" back together again and readied it for its debut. It had also been decided that bombs would be dropped on at least two cities, the dropping of the second

bomb following as soon as a sufficient amount of plutonium could be processed and delivered in Tinian. The targets had also been selected. Hiroshima was chosen as the first target, because Hiroshima was the only one of the four target cities with no reported prisoners of war camps.

A single B-29 plane\(^1\) carrying a crew of 11 lifted the 'Little Man' from the Tinian Island in the Marianas on August 6, 1945 and dropped it from an altitude of 20,000 ft. on Hiroshima on the Southern end of Honshu.

"Combined heat and blast pulverized everything in the explosion's immediate vicinity, generated spontaneous fires some distance away, produced winds that fanned the flames in Hiroshima's crater like configuration so powerfully that they burnt almost 4.4 sq. miles (11Kms) completely out and killed between 70,000 and 80,000 people besides injuring more than 70,000 others".\(^2\)

Hiroshima lay in ruins, but news of its destruction did not reach military ears in Tokyo, until about noon on the day of the bomb, and it was not until 8 P.M. of August 8, i.e. sixty hours after the explosion that Japan realised that the weapon used was an atomic bomb. And less than eight hours later the second bomb, christened "Fat Man" was lifted into the sky from Tinian and dropped at 11.01 A.M. of August 9, on Nagasaki, within a few hours of Moscow's announcement that Russia

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1. Pilot Paul Tibbets christened the plane, 'Enola Gay' after his mother's name.
had declared war on Japan and was already attacking across the Manchurian border. The dropping of the Nagasaki bomb was not deferred or cancelled even when it was clear that it was not needed; how could this be done after so much money had gone into building it? As some one has satirically said, "Would an artist be content if he created two masterpieces and only one was shown"? The Nagasaki bomb killed between 35,000 and 40,000 people, injured a like number and devastated 1.8 sq.miles of territory. even though the Army was still adamant, on Emperor's personal intervention, Japan agreed to the Potsdam terms,"with the understanding that the said declaration does not compromise any demand which prejudices the prerogatives of His Majesty as a Sovereign Ruler".

The single Japanese condition posed an embarrassment. Truman had failed to make this symbolic concession before the bombs were dropped even though he had been urged to do so in order to obviate the need for dropping them. With almost 1,50,000 people already killed by the bombs, how would it look to agree to the condition which, had it been agreed upon earlier, might have spared those lives. But how then could the artist have displayed his masterpieces, or shown to the world

the power he had acquired which enabled him with a single stroke of his brush to wipe out the whole world? A compromise was found by declaring that the authority of the Emperor and the Japanese Government to rule Japan would be subject to the Supreme Commander of the Allied Powers and that the ultimate form of Government would be determined by the freely expressed will of the Japanese people. The Japanese war lords tried once again to stall the surrender but the tide of events could not be stemmed and Japan's surrender became a fait-accompli. Anami, the War Minister committed harakiri, and such resistance as still remained ended with five of the Army Chiefs falling to their knees on the Imperial plaza, and disembowelling themselves as the War Minister had already done.

There had descended on the unsuspecting cities of Hiroshima and Nagasaki the nightmare of death and unparalleled suffering. And on the world descended what was then called and considered to be "peace". A post war era called the atomic age rose from the ashes of Hiroshima and Nagasaki. The post war scene brought about a dramatic change in the appearance of the world. It was best summed up by General Charles De Gaulle:

"No sooner had the sound of gunfire faded than the world's appearance changed. The strength and the spirit of the people mobilised for the war suddenly lost their unifying object, while the ambition of states reappeared in all its virulence. The Allies revoked those considerations and concessions they had necessarily granted each other in time of peril when they were confronting a common enemy. Yesterday was the time for battle, the hour for settling accounts had come."

The ravages of war were visible everywhere. The balance of power that had characterised the pre-war era collapsed with the fall of the Third Reich. France and Great Britain emerged gravely weak and vulnerable. Only the United States and the Soviet Union emerged as powers to reckon with. Both, it became clear, would have a major role to play in the affairs of Europe and the world. Strangely most of these developments had been foreseen by Hitler, the precipitator of the second world war. On April 2, 1945, he made a statement of frightening prescience. He had said:

"With the defeat of the Reich, there will remain in the World only two great powers capable of confronting each other- the United States and Soviet Russia. The laws of both history and geography will compel these two powers to a trial of strength- either military or in the fields of economics or ideology and it is equally certain that both these powers will sooner or later find it desirable to seek the support of the sole surviving great nation in Europe, the German people."

From the ravages of war the Union of Soviet Socialist Republics(USSR) and the U.S.A. rose like two giants confronting each other. Competition replaced cooperation of the erstwhile allies. With the disappearance

Recent events and developments, on the world stage, do point in that direction. May be Germany has still some role to play in shaping the destiny of the world alongwith the super powers. In this respect, a recent foreign policy statement by the U.S.Deputy Secretary of State, Lawrence Eagleburger is revealing. He stated that "The post world war II era in which the United States and the soviet Union largely dominated the international agenda was ending, with Japan and Western Europe expected to take a larger political role."
See HINDUSTAN TIMES, New Delhi, October 26, 1989.
of the common threat of the axis powers, their ideological, social, cultural and economic differences became more and more pronounced and seemed irreconcilable. Even though the U.S.S.R. was well on the road to making the bomb (with vital information about the making of bomb having been supplied to it by physicist Klaus Fuchs who was associated throughout with the bomb project and had been acting as a spy) it still felt threatened by the bomb; this sense of insecurity was aggravated by tensions arising out of colossal losses suffered during the war. It is estimated that Russia had lost 11,000,000 combatants and 7,000,000 civilians apart from suffering material losses. The attitude of the U.S. Government was far from conciliatory. Truman in a letter to the Secretary of State James Brynes on January 5, 1946, directed that the "Russians be shown the iron fist". Winston Churchill's speech at Fullton Missouri described Russia as enemy number one of the West. The seeds of a cold war were thus sown in the hot bed of a hot peace that descended on the world after the war.

Cold war on the one hand and an unprecedented search for security on the other have been the hall marks of our age. The former divided the world into two hostile camps, and the latter initiated a mad race for the acquisition of atomic capability for those who did not possess it, and for those who possessed it, the necessity to achieve and maintain atomic superiority became the

prime concern. What ensued initially was a quantitative build up of war heads; it was followed immediately by a qualitative advancement in the field of weapons of destruction with the help of science and technology. The impact of the lethality of the bomb had equally stunned the victors and the vanquished. The aftermath of Hiroshima and Nagasaki were a clear warning to humankind and later studies on the effects of the bomb have made it all too clear that mankind cannot afford another war. It is amazing that the mad race has gone on for nearly 45 years unabated, with things having come to such a pass that the mankind might finally choose to annihilate itself.

What mankind has achieved in the last four decades in terms of weaponry is indeed impressive. After the U.S.A., the U.S.S.R. was the first to acquire the bomb in August 1949. The United Kingdom acquired it in 1952. France went nuclear in 1960. China acquired it in 1964.

With the test explosion carried out by India at Pokhran in 1974, India is also credited with having joined the nuclear club, even though nothing further has been done to acquire what is called nuclear capability. It appears that acquisition of nuclear weapons has become a global phenomenon, justified by the powers concerned on several grounds, such as the belief that nuclear capability provides a safe deterrent, in some cases it is fear and mistrust which are the principal factors, in others it has become something of a status symbol. The stock-piles collected have proliferated not only
quantitatively but there have been spectacular advances in quality, with deadlier weapons being evolved with amazing rapidity, the degree of sophistication achieved being truly phenomenal.

Vast sums have been allocated for the research and development of new, more advanced, more lethal and accurate weapon systems. From Atom Bomb, the world moved to the more destructive Hydrogen Bomb and then to the Neutron Bomb. Inter Continental Ballistic Missiles (ICBMs), and Submarine Launched Ballistic Missiles (SLBMs), New Satellite Surveillance Systems appeared in 1960s. During the 70s Anti Ballistic Missiles (ABMs) were produced followed by Multiple Independently Targetable Reentry Vehicles (MIRVs). During the early 80s, the U.S.A. started manufacturing the neutron munitions. These are low yield portable weapons with enhanced radiation which have further lowered the threshold for a nuclear war. The fact that some of the weapons evolved have eliminated the need for a total nuclear holocaust, or that some of the munitions do not damage property or again that their radiation effects are negligible, is but scant consolation for mankind which stands poised precariously on the edge of a precipice.

The U.S.S.R. has developed SSN 18, SSN 8 and SSN 20 which have a range of 8000 and 9000 kilometres. The Typhoon class submarine can carry 20 ballistic missiles each with 12 war heads. A broad idea of the delivery and weapon systems in vogue is provided by the Tables given in Appendix IB marked as Tables 1.1 to 1.8.

The world has since advanced to X-Ray and Gamma Ray Lasers, Electromagnetic Rail Guns, Charged Particle Beams and Anti satellite systems which now form part and parcel of the third generation weapons.

Giant strides have been made also in the field of chemical and biological weapons. These terror weapons are reported to have been used during the first world war and are said to have caused 1,300,000 casualties. They were used repeatedly, before and after the second world war reportedly in Abyssinia by the Italians (1936), in China by the Japanese (1934-43), and according to several reports (unconfirmed) by the Soviet Union and Egypt in Yemen (1962-63) and in Afghanistan (since 1980). Furthermore there have been reports of the use of such weapons against unprotected guerrillas in Angola, Ethiopia, Guatemala, Iraq, Kampuchea, Laos and Vietnam. The latest accusation of this kind points to Iraq in its recently concluded war with Iran.  

   A U.N. Fact-finding mission which visited the Islamic Republic of Iran in 1984, confirmed that Chemical Weapons had been used there.
Recent reports suggest that more sophisticated chemical weapons are being developed to meet conditions of undetectability. It is feared that new chemical substances will replace the traditional agents (like Yperite and Nerve Gas) still abundantly stockpiled in Europe, the United States and the Soviet Union.

The biological weapons were banned by a convention signed in 1972. Research on chemical weapons, however, continues. Once again it is the U.S.A. and the U.S.S.R. which occupy the leading place in the research and development of new chemical substances. Both maintain impressive stockpiles of traditional chemical weapons. But in contrast to the elaborate statistics on conventional and nuclear weaponry, the precise size of these stockpiles is not known. Much therefore must be left to speculation. Western estimates of the Soviet stockpile range between 300,000 and 700,000 tons of immediately usable chemical war agents. The U.S. stockpile of usable chemical munitions is also formidable amounting to some 70,000 tons and a further 200,000 tons are held in bulk storage. The United States

1. Article 1 of the Convention states that "Each state party to this Convention undertakes never in any circumstances to develop, produce, stockpile or otherwise acquire or retain:

   microbial or other biological agents, weapons, equipment or means of delivery designed to use such agents or toxins for hostile purposes in an armed conflict".

like the Soviet Union has extensive research and development programmes and a Chemical Corps of some 2,000 troops. The Soviet chemical troops form a separate combat arm and number more than 100,000 fully trained men with high mobility and modern equipment.¹

As though man's exploitation of earth was not enough, weapon systems have moved into the space. The first satellite made by the Soviet Union went into orbit in 1957. In 1961, Yuri Gagrin became the first man in human history to travel in space and since that day and after two American astronauts Neil A. Armstrong and Edwin E. Aldrin landed on the moon on July 21, 1969, man's exploits in space have increased manifold. Technology has advanced to such an extent that space crafts are able to travel millions of light years away from our planet. Efforts are even being made to put entire laboratories into space, or to set up space transportation systems for regular use (e.g. The Space Shuttle Programme of the United States).

Till the 1970s the space programmes of the U.S. and to a great extent those of the U.S.S.R. served almost exclusively civil and scientific purposes, or at any rate this is what was professed. Later the scene began to change. The dividing line between the military and non-military uses of space became increasingly blurred.

Emphasis clearly shifted to the military domain. In 1987, some 75 per cent of all the satellites orbited during the year were launched for various military purposes. The satellites launched for military purposes include: reconnaissance satellites, communication satellites, meteorological satellites, navigation satellites and early-warning satellites.

Military dependence on the use of space has tended to increase. Satellites have become an integral part of the military operations and defence plans of the super powers. France, China and India also have satellites in the orbit. Sky is thus no longer immune to the ravages of man.¹

Thus the stage is also set for a war in space. The Strategic Defence Initiative (Star Wars) of the U.S.A. has further escalated the race. While the threat of a nuclear war looms large on the earth, the U.S.A. has added another dimension to this by launching the "Star Wars Programme" in space. Apart from being frightfully costly,² the programme is likely to trigger the arms race to yet bigger dimensions. Whether the SDI would ensure security for mankind as claimed by the U.S.A. remains to be seen; right now it is creating such insecurity as has no parallel in history. The Soviets call it the

²During the Fiscal year 1985, approximately $2 billion (Total for DOD and DOE) were requested. During the fiscal year 1986-89 period approximately $24 billion were expected to be spent. For details see Sydney D.Drell, Philip J.Earley, David Holloway,THE REAGAN STRATEGIC DEFENCE INITIATIVE: A TECHNICAL, POLITICAL AND ARMS CONTROL ASSESSMENT,(Camb. Mass, Ballinger Publishing Co., 1985) p. 108.
Manhattan II. They maintain that though the U.S.A. wants the world to believe that the SDI may go no further than scientific research, in reality it is not so. In its time, Manhattan Atomic Bomb Project too started out as a research programme. And everybody knows, how it affected the people of Hiroshima and Nagasaki. Ever since then the world has lived in the shadow of a nuclear threat. The star wars programme will bring mankind face to face with newer and greater dangers.

Even as far back as 1969, General W.C. Westmoreland, then Chief of Staff U.S. Army visualised the automated battle field, in the following words: 2

"On the battlefield of the future, enemy forces will be located, tracked and targeted almost instantaneously through the use of data links, computer assisted intelligence evaluation, and automated fire control. With first round kill probabilities approaching certainty, and with surveillance devices that can continually track the enemy, the need for large forces to fix the opposition physically will be less important.

I see battlefields, on which we can destroy anything we locate through instant communication and almost instantaneous application of highly lethal fire power."

The weapons used on the automated battle field of the future will be mainly guided weapons, surface to surface missiles and guided bombs. These may be fitted with automatic homing devices so that, once launched, the missiles will seek out and destroy their target without further external help. They are the so called 'fire and forget' missiles.

The atomic bomb dropped on Hiroshima, exploded with an explosive power equivalent to that of about 20,000 tons of T.N.T. It weighed about four tons, so that the yield to weight ratio was about 5000. The warhead deployed on the American Minuteman III intercontinental ballistic missile, has an explosive power equivalent to that of about 330,000 tons of T.N.T. and weighs only one tenth of a ton, so that the yield to weight ratio is about three million, close to the theoretical limit.

The Hiroshima bomb was dropped from a B-29 bomber with an accuracy that depended on the eye sight of the bomb aimer, making it difficult even to state the circular error of probability (CEP). But a modern ICBM has a CEP of about 200 metres over a range of about 15,000 kilometres. A CEP of a few tens of metres is foreseeable.¹

The improvements in nuclear warhead designs and accuracy indicate the incredible progress made by military technology over the past 30 years. In the next 30 years world can expect technological revolutions in the fields of Anti Submarine Warfare, Anti Ballistic Missiles, Anti Satellite Warfare, Electronic Warfare, Environmental and Psychological Warfares. The battle field of the future would be fully automated.

In the field of high technology military systems there shall be rapid advances in Air Defence Systems, Navigational Systems, Early Warning Systems, Air Borne Warning and Control Systems, Command, Control and Communications as well as Reconnaissance and Intelligence.

¹ Frank Barnaby, op. cit., pp. 117-118.
Lasers, Radar, Heavy Particle Beams, Chemical Explosive Technology, and Missile Guidance systems are likely to revolutionise advancement in the above mentioned specific fields. ¹

These military technological revolutions will significantly affect—²

(a) Weapons of mass destruction—nuclear, chemical and biological:

(b) Conventional weapons—armoured vehicles, aircraft, warships, submarines, missiles, artillery, bombs, anti-personnel weapons, and remotely piloted vehicles.

(c) Military tactics and strategies—nuclear and conventional, on land, sea and air.

The race that had started between the two super powers at the dawn of the atomic age, continued at a frenzied pace. Other nations of the world who were spectators once, and were appalled at the unfolding scenario, suddenly saw their own security threatened and joined per force as participants in the maddening race setting aside their other over-riding considerations of economic advancement. In an annual review of world military expenditure, Lehman, the director of the U.S. arms control and disarmament agency, stated in October 1987, that world military spending had crossed the one trillion mark in 1987, which represented nearly five and a half per cent of the world's aggregate product. He also

¹. For details see Curt Gasteyger, SEARCHING FOR WORLD SECURITY, (London, Francis Pinter, 1985) pp. 155-158.
said that at least 16 developing countries had acquired, or were acquiring or developing their own ballistic missiles which meant that the danger to regional security, posed by the proliferation of these weapons was becoming more apparent.¹

According to a Report by the Stockholm International Peace Research Institute(SIPRI) during the past decade (1970s) the international trade in conventional armaments had increased dramatically. New supplies and new recipients entered the arms market and the weapons supplied became more sophisticated and expensive, and the chance of controlling the arms trade diminished. In fact the global arms trade went out of control during this period. The SIPRI arms trade statistics show that the global trade in major conventional weapons further increased in 1987. Total deliveries reached the figure of roughly $35 billion of which $24.7 went to Third World Nations.²

The five largest exporters are the U.S.A., the U.S.S.R., France, The U.K. and China. They provide 80 per cent of all global deliveries. The rest of the market is divided among a large number of smaller suppliers, including a large number of Third World manufacturers.³

¹INDIAN EXPRESS, October 5, 1989.
³Ibid. p. 177.
The largest importers are in the Near East and Middle East. In 1978, Iran and Iraq and Israel each accounted for about 7 per cent of the whole, with South Korea in about the same proportion. Over the quinquennium 1975-79, Iran (16%), far outstripped the rest followed by Saudi Arabia (7%), Libya (7%), Iraq (6%), Jordan (6%), South Korea (6%), Israel (5%), Syria (3%) and India (2.5%). Between 1983-87 Iraq imported $15736 million, Iran $2297 million, Saudi Arabia $7865 million, India $12589 million, and Pakistan $2940 million worth of armaments.¹

All this gives us a broad picture of the post war world in which there has been rapid advancement in science and technology on the one hand and an equally rapid regression on the other, in old values which had helped to sustain mankind. This is a world which has been brought closer and made more compact by man's genius, the same genius has initiated a return to fundamentalism in religion, reinforced narrow nationalism, and differences of caste, colour and creed. Concerns which should have been human and global have become narrow and selfish.

The implications of the arms race, the scientific and technological advancement, and the arms trade, which are the hall marks of the new era which began with the advent of the atomic age are more than apparent.

¹Aaron Karp, op. cit., p.178.
The spectre of a nuclear catastrophe looms large over the horizon. Humanity lives under a sense of constant fear. Mistrust and suspicion have come to rule international politics. A sense of insecurity pervades the international scene and there looms a constant fear that any time even a trivial incident might trigger a major confrontation between the super powers. There is also the constant threat of nuclear proliferation. The list of nuclear weapon states does not end with the five - the U.S.A. (since 1945) the U.S.S.R. (since 1949), the U.K. (since 1952), France (since 1962) and China (since 1964). Several third world countries have acquired the capability and the knowhow to produce nuclear weapons. They conduct significant nuclear activities and operate nuclear plants which are capable of producing weapon grade material. They have not signed the NPT nor have they acknowledged the possession of nuclear weapons. The important ones of the so called nuclear threshold countries are Israel, Pakistan and India, South Africa, Brazil and Argentine. Iran, Iraq and Libya which have signed the NPT, have been publicly questioned for their commitment to the treaty. Definite indications as to their nuclear profile are available and substantiated.¹

¹For details see, WORLD ARMAMENT AND DISARMAMENT YEAR BOOK,(SIPRI, Oxford University Press, 1988) p.56. The information that Israel had a substantial nuclear arsenal was leaked out by a former technician in the Israeli nuclear facility in 1986. WORLD ARMAMENT AND DISARMAMENT YEAR BOOK, SIPRI, 1988 mentions that India has an ambitious missile delivery programme and can produce approximately 15 nuclear weapons per year. In case of Pakistan, in a recent interview with an Indian journalis Kuldip Nayar, Dr. Abdul Quadeer Khan (the father of Pakistan's nuclear programme) clearly stated "America knows it; what the CIA has been saying about our possessing the bomb is correct and so is the speculation of some foreign newspapers." Quoted in John Kahiyalil, "The Pakistan Bomb Through its Media," STRATEGIC ANALYSIS, Vol.11(3),1987, p. 281.
It is not only the governments which are acquiring or wanting to acquire nuclear capability. It is a painful fact of history that groups of terrorists have sprung up in different parts of the world who are out to subvert the established orders. In their pursuit of power, the possibility of their attempting to procure nuclear arms cannot be ruled out. They can acquire them (i) by stealing an already assembled weapon from the stock-piles of nuclear weapon states, (ii) by buying or receiving the weapon as a gift from one of the nuclear powers, or (iii) by constructing their own weapon by stealing or buying the material from the nuclear electric power industry.¹

Nuclear accidents also cannot be ruled out any more. There have been several cases already, which show that the threat is indeed real. It is worthwhile to mention some of these.²

A B-47 bomber accidentally dropped a nuclear weapon over Mars Bluff, South Carolina on March 11, 1958. The conventional explosive 'Trigger' of the nuclear bomb exploded leaving a crater 75 feet wide and 35 feet deep. Luckily no nuclear radiation was detected, no nuclear explosion occurred and no one was killed.

   By the same author see also NUCLEAR PROLIFERATION PROBLEMS, (SIPRI. The MIT Press 1974), pp.187-191.
In 1961 in Goldsbaro North Carolina, five of the six interlocking devices were set off by a fall. A single switch prevented the bomb from exploding - an explosion which would have been 1800 times more powerful than the Hiroshima bomb.

On January 17, 1966, an American B-52 bomber collided with a KC 135 refuelling tanker over Palmares, in Spain causing the death of five crewmen and the dropping of four hydrogen bombs which were recovered after an intensive ground and sea search. Radioactive leakage and conventional explosions occurred in the area.

An incident described in Etzioni's 'The Hardway to Peace' relates how the Test Pilot killed himself and shot down the plane he was travelling in. The test pilot Thomas Atteridge who was flying a single seat jet over the Atlantic ocean near long islands, test fired his guns. A few minutes later he crashed without warning into the woods about three miles from where he had fired. His jet was hit by three of his own bullets. Flying at a speed, faster than that of his shells, although following a different course, test pilot Atteridge had entered the bullets' trajectory and shot down his own plane and himself.

The Chernobyle radio-active leak some three years ago highlighted the risks involved. The accident showed that no matter how fool proof a design may appear to be,

the potential dangers of nuclear power remain awesome. What caused the disaster nobody knows. The Russian reports attribute it to human frailty. Even in earlier accidents, human frailty has been the main cause.

The latest in the series of disasters was the sinking in April 1989, of one of Moscow's newest attack submarines which has touched off a fierce and silent controversy as also an underground espionage race. It had a crew of 95 when it sank in mile deep Norwegian sea. Norwegians are feeling deeply concerned, despite Mikhail Gorbachev's prompt assurance that the submarine's reactor had been shut down before it sank. Even so the experts have not yet been able to rule out the possibility of radio-active leakage. The submarine was identified as the only one of its kind, launched in 1983 with a thick, titanium pressure hull for strength and quiet running and two liquid-metal-cooled reactors to provide extra power and speed.

Environmental consequences of a nuclear fall-out are well known. Frequent nuclear tests and explosions are likely to generate vast quantities of nitrogen oxides and other pollutants which might deplete the earth's ozone layer. The consequences of an all out nuclear war, have been referred to in many of the recent studies which talk of the possibility of what is now described as the nuclear winter. Mankind is being led, it seems, to total extinction.

Military industrial complexes have become all too powerful.\textsuperscript{1} High military spending has adversely affected trade and has destabilized exchange rates. The economics of arms race have direct links with development specially in the third world countries, which are poor and under-developed. There is no gainsaying, that if the vast sums of money and resources currently spent on defence and arms are diverted to developmental purposes, poverty can be blotted out from the surface of the earth and disparities between the rich and the poor abridged, eliminating thereby large areas of friction and discord.\textsuperscript{2} Some interesting comparisons have been made by Willy Brandt in this respect which are quite relevant even today. These are:\textsuperscript{3}

(i) Military expenditure of half a day would be enough to finance the World Health Organisation programme to eradicate Malaria.

(ii) The money a modern tank costs could improve storage for 100,000 tonnes of rice, so that annual wastage of 4000 tonnes or more would be avoided - a day's ration for eight million people.

(iii) The same would be enough to provide 1000 class rooms for 30,000 children.

(iv) The price of a fighter plane would equip 40,000 village pharmacies.

(v) The price of a new nuclear submarine is equivalent to the education budgets of 23 developing countries with 160 million children of school age.

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It is obvious and accepted by financial experts that an end to the arms race can alleviate poverty and remove major causes of friction and discord. The International Conference on the Relationship between Disarmament and Development, held in New York between 24 August and 11 September 1987, reiterated that "The links between disarmament and development are complex but crucial. They need to be understood within a redefined notion of 'security'. For the Third World there can be no true security, unless economic development occurs in the mildest sense of the term."\(^1\)

The picture is indeed dismal but to think and believe that the atomic age has been an unmitigated evil would not be fair. The unleashing of the atom has set into motion certain positive forces also. On the one hand, the concern for peace has become permanent and on the other the concept of war has undergone a drastic change. The concern for peace has been manifested in various peace initiatives, taken by nations, by non governmental organisations(NGOs) and by people from all walks of life voluntarily, from time to time.\(^2\) This indeed is a positive effect. The change in the concept of war was made apparent soon after the bombs were dropped on Hiroshima and Nagasaki. It was proved beyond doubt that modern war will not make any distinction

\(^2\)These are discussed in Chapter III, DISARMAMENT NEGOTIATIONS: A REVIEW.
between the victor and the vanquished. Recent studies made by various scholars, on the effects of nuclear war, have brought to light the realisation that unless man begins to retrace his steps the whole human race faces a threat of total extinction. There is indeed a world to lose for the gain of a tottering security.

The obsolescence of the present political, social and economic institutions has also become apparent. With the advancement that has overtaken humanity, and the interdependence of nations which has resulted thereby, the problems faced by nations have become global in character. The solutions to be sought have also to be global in character. While the saner elements of the human race have realised this, the efforts in this direction are far from being adequate. To meet the challenges of this super age, what is required is a degree of statesmanship, compatible with the requirements of the situation which can serve to establish political, social and economic orders such as can ensure peace and harmony and sustain growth. Present world institutions are a legacy of the 19th century. Mankind seems to be living in the past while the need for change is becoming ever more urgent. That there is need for a safe and more stable world and this requires dismantling of very large military establishments and nuclear war-heads is also clear. In order to bring in development, the underdeveloped nations of the world have to divert large sums spent on defence, for developmental purposes in order to usher in peace and prosperity followed by stability.
The concept of sovereignty which had occupied a place of pride in the national and international politics has now been relegated to a back seat and might become irrelevant. The independent sovereign state appears to be unworkable in the atomic age, following the destruction of Hiroshima by a single bomb. The radio-active fall-out from nuclear weapons does not know any physical boundaries and the satellites in space keep track of happenings on foreign and distant lands making traditional frontiers irrelevant.

The days when the states could function independently on traditional lines ever ready to guard their sacred soil and win their just wars are over. Now they have at their disposal some trillion dollars worth of weapons both thermonuclear and conventional which make no distinction between the victors and the vanquished. In sophistication, range, lethality, accuracy and effect, they have long surpassed the traditional boundaries of the nation state.

In short, the situation as it prevails today calls for drastic shifts in thinking, in policies and institutions. The basic premises on which the new order of things can be built must take into account—

(i) that a total war in the context of present day realities which means total extinction is unthinkable and must be discarded;

(ii) that security is indivisible and armaments instead of providing security to nations, enhance insecurity;

(iii) that new tools of conflict resolution have to be sought on a global scale;
(iv) that there is no choice but to deal with the constraints and obstacles to disarmament firmly by discarding the antiquated mind-sets;

(v) that peace, justice and prosperity are the ultimate goals to be achieved by humankind and for the achievement of good ends means employed have to be good also;

(vi) that new political and economic institutions and new working ideologies need to replace the old ones to meet the requirements of the new age and aspirations of the new generations.

This is the thrust of the succeeding chapters.

India's perceptions regarding disarmament are quite clear and forthright and are on the same lines. These are discussed in some detail in Chapter-...