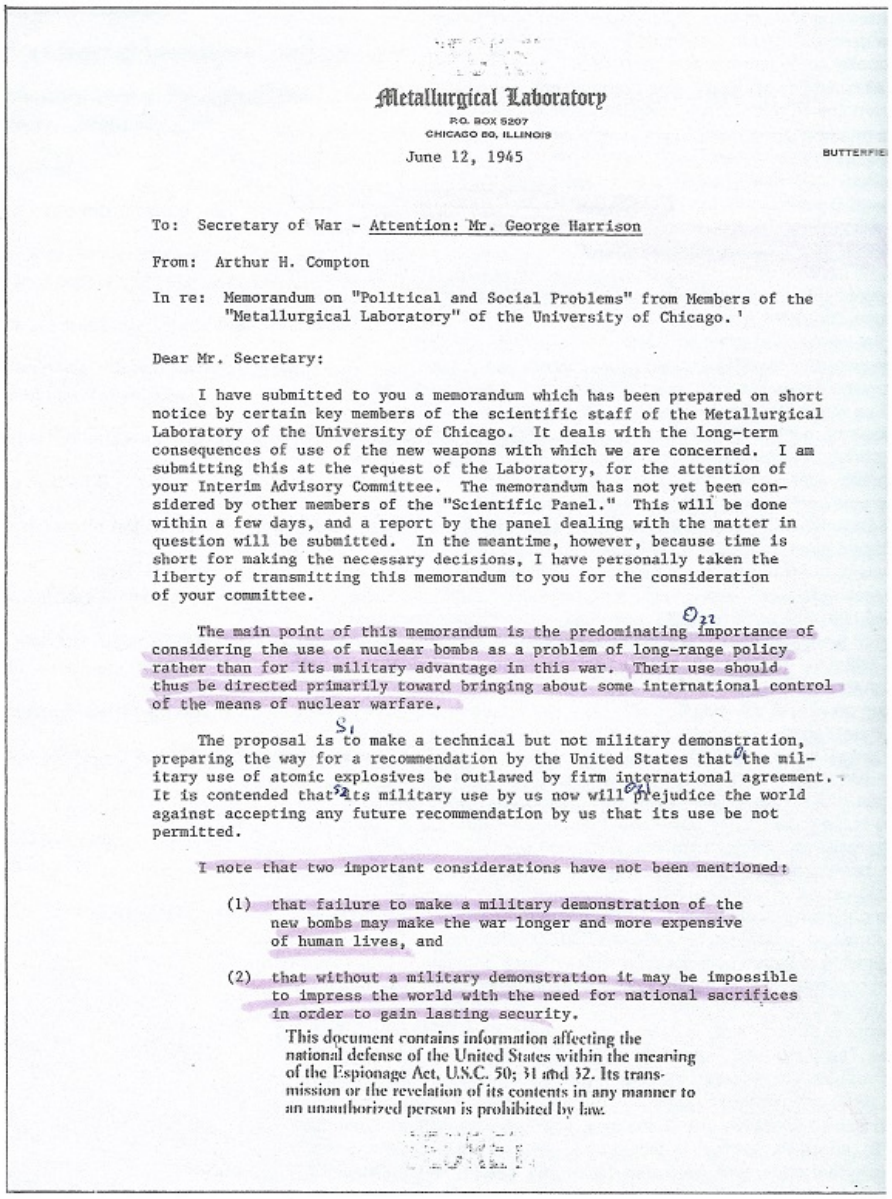
**Argumentations of the scientists**

***Decision problem 1 Letter of Compton to the secretary of state Harrison***

This is the introductory letter to the report of the researchers of the Metallurgical Laboratory of the University of Chicago (decsion2).

Text in Stoff page 138





Metallurgical Laboratory
P.O. BOX 5207
CHICAGO 80, ILLINOIS

June 12, 1945

To: Secretary of War - Attention: Mr. George Harrison

From: Arthur H. Compton

In re: Memorandum on "Political and Social Problems" from Members of the "Metallurgical Laboratory" of the University of Chicago.[1]

Dear Mr. Secretary:

I have submitted to you a memorandum which has been prepared on short notice by certain key members of the scientific staff of the Metallurgical Laboratory of the University of Chicago. It deals with the long-term consequences of use of the new weapons with which we are concerned. I am submitting this at the request of the Laboratory, for the attention of your Interim Advisory Committee. The memorandum has not yet been considered by other members of the "Scientific Panel." This will be done within a few days, and a report by the panel dealing with the matter in question will be submitted. In the meantime, however, because time is short for making the necessary decisions, I have personally taken the liberty of transmitting this memorandum to you for the consideration of your committee.

The main point of this memorandum is the predominating importance of considering the use of nuclear bombs as a problem of long-range policy rather than for its military advantage in this war. Their use should thus be directed primarily toward bringing about some international control of the means of nuclear warfare.

The proposal is to make a technical but not military demonstration, preparing the way for a recommendation by the United States that the military use of atomic explosives be outlawed by firm international agreement. It is contended that its military use by us now will prejudice the world against accepting any future recommendation by us that its use be not permitted.

I note that two important considerations have not been mentioned:

(1) that failure to make a military demonstration of the new bombs may make the war longer and more expensive of human lives, and

(2) that without a military demonstration it may be impossible to impress the world with the need for national sacrifices in order to gain lasting security.

This document contains information affecting the national defense of the United States within the meaning of the Espionage Act, U.S.C. 50; 31 and 32. Its transmission or the revelation of its contents in any manner to an unauthorized person is prohibited by law.

[1]See Document 49.

## Analysis

It starts with a general introduction. The Second paragraph of the report suggests ”the predominating importance of considering the use of the nuclear bombs as a problem of long range policy rather than for its military advantage in this war.

The real options are mentioned in the next paragraph

In the last paragraph Compton adds his own estimations. However, he does not make a choice so this is ignored.

**Decision tree**

S1 = to make a technical but not military demonstration plus a recommendation by the US to outlaw the military use of atomic explosives

O1= an agreement to Outlaw nuclear weapons (not mentioned but implied)

S2= military use by the US

O21= prejudice the world against accepting any future recommendation by the US to outlaw these weapons

O22= military advantage in the war (see above)

The previous paragraph suggests that the long range policy is more important than the military advantage of the weapon in this war

Therefore the suggested strategy was S1

**Decision rule**

The rule that this strategy predicts is the lexicographic rule

***Decision problem 2 Franck , Preamble of the report of the Metallurgic laboratory***

Text in Stoff page 140

**Document 49** The Franck Report, June 11, 1945

German chemist

## I. PREAMBLE

The only reason to treat nuclear power differently from all the other developments in the field of physics is the possibility of its use as a means of political pressure in peace and sudden destruction in war. All present plans for the organization of research, scientific and industrial development, and publication in the field of nucleonics are conditioned by the political and military climate in which one expects those plans to be carried out. Therefore, in making suggestions for the postwar organization of nucleonics, a discussion of political problems cannot be avoided. The scientists on this Project do not presume to speak authoritatively on problems of national and international policy. However, we found ourselves, by the force of events during the last five years, in the position of a small group of citizens cognizant of a grave danger for the safety of this county as well as for the future of all the other nations, of which the rest of mankind is unaware. We therefore feel it our duty to urge that the political problems, arising from the mastering of nuclear power, be recognized in all their gravity, and that appropriate steps be taken for their study and the preparation of necessary decisions. We hope that the creation of the Committee' by the Secretary of War to deal with all aspects of nucleonics, indicates that these implications have been recognized by the government. We believe that our acquaintance with the scientific elements of the situation and prolonged preoccupation with its world-wide political implications, imposes on us the obligation to offer to the Committee some suggestions as to the possible solution of these grave problems.

Scientists have often before been accused of providing new weapons for the mutual destruction of nations, instead of improving their well-being. It is undoubtedly true that the discovery of flying, for example, has so far brought much more misery than enjoyment and profit to humanity. However, in the past, scientists could disclaim direct responsibility for the use to which mankind had put their disinterested discoveries. We feel compelled to take a more active stand now because the success which we have achieved in the development of nuclear power is fraught with infinitely greater dangers than were all the inventions of the past. All of us, familiar with the present state of nucleonics, live with the vision before our eyes of sudden destruction visited on our own country, of a Pearl Harbor disaster repeated in thousand-fold magnification in every one of our major cities.

In the past, science has often been able to provide also new methods of protection against new weapons of aggresson it made possible, but it cannot promise such efficient protection against the destructive use of nuclear power. This protection can come only from the political organization of the world. Among all the arguments calling for an efficient international organization for peace, the existence of nuclear weapons is the most compelling one. *In the absence of an international authority which would make all resort to force in international conflicts impossible, nations could still be diverted from a path which must lead to total mutual destruction, by a specific international agreement barring a nuclear armaments race.*

**Analysis**

He starts with an argument why they write about this issue, not that they are the authority on this topic but they are the people who know about the consequences of the nuclear bomb while the rest of the population does not know about it because of the secret development in Los Alamos.

The second paragraph discussed the effect of scientific inventions. Normally these inventions could have been used for the benefit of mankind or not. But in this case the scientists have developed a weapon with infinitely greater dangers.

The next line is a general outcome. All of us live with the vision before our eyes of

Sudden destruction visited on our country, of a Pearl Harbor disaster repeated in thousand-fold magnification in every one of our major cities .

It is not being said but one can imagine that they expect this outcome of the not mentioned strategy1 :

S1 Going on this path of the development of nuclear bombs (short denoted as Arms ace)

They next indicate the probability saying:

P11 Science cannot promise

011 such an efficient protection against the destructive use of nuclear power as against other weapons.

P12 most likely there will be no protection (not mentioned)

O12 total destruction (implied)

Then a second possible strategy is mentioned but immediately rejected as impossible as follows

" in the absence of an international authority which would make all resort to force in international conflict impossible with as a consequence total mutual destruction"

So the protection **can only come from** another strategy which is:

S2 International agreements between nations "barring" a nuclear armament race

O21 divert from a path which must lead to total mutual destruction

P21 could

022 arms race and mutual destruction (implied)

P22 could (implied)

Strategy 2 is obviously suggested as the preferred strategy.

**Decision tree**

| S1 arms race | | S2 International agreements | |
|---|---|---|---|
| P11 science can not promise | p12 most likely | p21 could | p22 could not |
| 011= protection Against mutual destruction | o12 total destruction | o21 divert mutual destruction | o22 arms race and mutual destruction |

**Decision table**

| | Protection against Mutual destruction 011= o21 | mutal or total destruction o12=022 | divert mutual destruction 021 |
|---|---|---|---|
| S1 arms race | u11=+ P11 Science cannot promise | u12=- p12=most likel | |
| S2 International Agreements | | u22=- p22=could | u21=+ p21 could |

**Decision rule**

Risk avoiding rule predict the preferred strategy

***Decision problem 3***

***Franck , the report of the Metallurgic laboratory***

Text in Stoff page 140-143



**Document 49** The Franck Report, June 11, 1945

German chemist

## I. PREAMBLE

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## II. PROSPECTS OF ARMAMENTS RACE

It could be suggested that the danger of destruction by nuclear weapons can be avoided—at least as far as this country is concerned—either by keeping our discoveries secret for an indefinite time, or else by developing our nucleonic ar-

maments at such a pace that no other nations would think of attacking us from fear of overwhelming retaliation.

The answer to the first suggestion is that although we undoubtedly are at present ahead of the rest of the world in this field, the fundamental facts of nuclear power are a subject of common knowledge. British scientists know as much as we do about the basic wartime progress of nucleonics—if not of the specific processes used in our engineering developments—and the role which French nuclear physicists have played in the pre-war development of this field, plus their occasional contact with our Projects, will enable them to catch up rapidly, at least as far as basic scientific discoveries are concerned. German scientists, in whose discoveries the whole development of this field originated, apparently did not develop it during the war to the same extent to which this has been done in America; but to the last day of the European war, we were living in constant apprehension as to their possible achievements. The certainty that German scientists are working on this weapon and that their government would certainly have no scruples against using it when available, was the main motivation of the initiative which American scientists took in urging the development of nuclear power for military purposes on a large scale in this country. In Russia, too, the basic facts and implications of nuclear power were well understood in 1940, and the experience of Russian scientists in nuclear research is entirely sufficient to enable them to retrace our steps within a few years, even if we should make every attempt to conceal them. Furthermore, we should not expect too much success from attempts to keep basic information secret in peacetime, when scientists acquainted with the work on this and associated Projects will be scattered to many colleges and research institutions and many of them will continue to work on problems closely related to those on which our developments are based. In other words, even if we can retain our leadership in basic knowledge of nucleonics for a certain time by maintaining secrecy as to all results achieved on this and associated Projects, it would be foolish to hope that this can protect us for more than a few years.

It may be asked whether we cannot prevent the development of military nucleonics in other countries by a monopoly on the raw materials of nuclear power. The answer is that even though the largest now known deposits of uranium ores are under the control of powers which belong to the "western" group (Canada, Belgium, and British India), the old deposits in Czechoslovakia are outside this sphere. Russia is known to be mining radium on its own territory; and even if we do not know the size of the deposits discovered so far in the USSR, the probability that no large reserves of uranium will be found in a country which covers $^{1}/_{5}$ of the land area of the earth (and whose sphere of influence takes in additional territory), is too small to serve as a basis for security. *Thus, we cannot hope to avoid a nuclear armament race either by keeping secret from the competing nations the basic scientific facts of nuclear power or by cornering the raw materials required for such a race.*

We now consider the second of the two suggestions made at the beginning of this section, and ask whether we could not feel ourselves safe in a race of nuclear armaments by virtue of our greater industrial potential, including greater diffusion of scientific and technical knowledge, greater volume and efficiency of our skilled labor corps, and greater experience of our management—all the factors whose importance has been so strikingly demonstrated in the conversion of this country into an arsenal of the Allied Nations in the present war. The answer is that all that these advantages can give us is the accumulation of a large number of bigger and better atomic bombs—and this only if we produce these bombs at the maximum of our capacity in peace time, and do not rely on conversion of a

peace-time nucleonics industry to military production after the beginning of hostilities.

However, such a quantitative advantage in reserves of bottled destructive power will not make us safe from sudden attack. Just because a potential enemy will be afraid of being "outnumbered and outgunned," the temptation for him may be overwhelming to attempt a sudden unprovoked blow—particularly if he should suspect us of harboring aggressive intentions against his security or his sphere of influence. In no other type of warfare does the advantage lie so heavily with the aggressor. He can place his "infernal machines" in advance in all our major cities and explode them simultaneously, thus destroying a major part of our industry and a large part of our population, aggregated in densely populated metropolitan districts. Our possibilities of retaliation—even if retaliation should be considered adequate compensation for the loss of millions of lives and destruction of our largest cities—will be greatly handicapped because we must rely on aerial transportation of the bombs, and also because we may have to deal with an enemy whose industry and population are dispersed over a large territory.

In fact, if the race for nuclear armaments is allowed to develop, the only apparent way in which our country can be protected from the paralyzing effects of a sudden attack is by dispersal of those industries which are essential for our war effort and dispersal of the populations of our major metropolitan cities. As long as nuclear bombs remain scarce (i.e., as long as uranium and thorium remain the only basic materials for their fabrication), efficient dispersal of our industry and the scattering of our metropolitan population will considerably decrease the temptation to attack us by nuclear weapons.

Ten years hence, it may be that atomic bombs containing perhaps 20 kg of active material can be detonated at 6% efficiency, and thus each have an effect equal to that of 20,000 tons of TNT. One of these bombs could then destroy something like 3 square miles of an urban area. Atomic bombs containing a larger quantity of active material but still weighing less than one ton may be expected to be available within ten years which could destroy over ten square miles of a city. A nation able to assign 10 tons of atomic explosives for the preparation of a sneak attack on this country, can then hope to achieve the destruction of all industry and most of the population in an area from 500 square miles upwards. If no choice of targets, with a total area of five hundred square miles of American territory, contains a large enough fraction of the nation's industry and population to make their destruction a crippling blow to the nation's war potential and its ability to defend itself, then the attack will not pay, and may not be undertaken. At present, one could easily select in this country a hundred areas of five square miles each whose simultaneous destruction would be a staggering blow to the nation. Since the area of the United States is about three million square miles, it should be possible to scatter its industrial and human resources in such a way as to leave no 500 square miles important enough to serve as a target for nuclear attack.

We are fully aware of the staggering difficulties involved in such a radical change in the social and economic structure of our nation. We felt, however, that the dilemma had to be stated, to show what kind of alternative methods of protection will have to be considered if no successful international agreement is reached. It must be pointed out that in this field we are in a less favorable position than nations which are either now more diffusely populated and whose industries are more scattered, or whose governments have unlimited power over the movement of population and the location of industrial plants.

If no efficient international agreement is achieved, the race for nuclear armaments will be on in earnest not later than the morning after our first demon-

stration of the existence of nuclear weapons. After this, it might take other nations three or four years to overcome our present head start, and eight or ten years to draw even with us if we continue to do intensive work in this field. This might be all the time we would have to bring about the regroupment of our population and industry. Obviously, no time should be lost in inaugurating a study of this problem by experts.

## III. PROSPECTS OF AGREEMENT

The consequences of nuclear warfare, and the type of measures which would have to be taken to protect a country from total destruction by nuclear bombing, must be as abhorrent to other nations as to the United States. England, France, and the smaller nations of the European continent, with their congeries of people and industries, would be in a particularly desperate situation in the face of such a threat. Russia and China are the only great nations at present which could survive a nuclear attack. However, even though these countries may value human life less than the peoples of Western Europe and America, and even though Russia, in particular, has an immense space over which its vital industries could be dispersed and a government which can order this dispersion the day it is convinced that such a measure is necessary—there is no doubt that Russia will shudder at the possibility of a sudden disintegration of Moscow and Leningrad and of its new industrial cities in the Urals and Siberia. Therefore, only lack of mutual *trust*, and not lack of *desire* for agreement, can stand in the path of an efficient agreement for the prevention of nuclear warfare. The achievement of such an agreement will thus essentially depend on the integrity of intentions and readiness to sacrifice the necessary fraction of one's own sovereignty, by all the parties to the agreement.

From this point of view, the way in which the nuclear weapons now being secretly developed in this country are first revealed to the world appears to be of great, perhaps fateful importance.

One possible way—which may particularly appeal to those who consider nuclear bombs primarily as a secret weapon developed to help win the present war—is to use them without warning on an appropriately selected object in Japan. It is doubtful whether the first available bombs, of comparatively low efficiency and small size, will be sufficient to break the will or ability of Japan to resist, especially given the fact that the major cities like Tokyo, Nagoya, Osaka and Kobe already will largely have been reduced to ashes by the slower process of ordinary aerial bombing. Although important tactical results undoubtedly can be achieved by a sudden introduction of nuclear weapons, we nevertheless think that the question of the use of the very first available atomic bombs in the Japanese war should be weighed very carefully, not only by military authorities, but by the highest political leadership of this country. If we consider international agreement on total prevention of nuclear warfare as the paramount objective, and believe that it can be achieved, this kind of introduction of atomic weapons to the world may easily destroy all our chances of success. Russia, and even allied countries which bear less mistrust of our ways and intentions, as well as neutral countries may be deeply shocked. It may be very difficult to persuade the world that a nation which was capable of secretly preparing and suddenly releasing a weapon as indiscriminate as the rocket bomb and a million times more destructive, is to be trusted in its proclaimed desire of having such weapons abolished by international agreement. We have large accumulations of poison gas, but do not use them, and recent polls have shown that public opinion in this country would dis-

approve of such a use even if it would accelerate the winning of the Far Eastern war. It is true that some irrational element in mass psychology makes gas poisoning more revolting than blasting by explosives, even though gas warfare is in no way more "inhuman" than the war of bombs and bullets. Nevertheless, it is not at all certain that American public opinion, if it could be enlightened as to the effect of atomic explosives, would approve of our own country being the first to introduce such an indiscriminate method of wholesale destruction of civilian life.

Thus, from the "optimistic" point of view—looking forward to an international agreement on the prevention of nuclear warfare—the military advantages and the saving of American lives achieved by the sudden use of atomic bombs against Japan may be outweighed by the ensuing loss of confidence and by a wave of horror and repulsion sweeping over the rest of the world and perhaps even dividing public opinion at home.

*From this point of view, a demonstration of the new weapon might best be made, before the eyes of representatives of all the United Nations, on the desert or a barren island.* The best possible atmosphere for the achievement of an international agreement could be achieved if America could say to the world, "You see what sort of a weapon we had but did not use. We are ready to renounce its use in the future if other nations join us in this renunciation and agree to the establishment of an efficient international control."

After such a demonstration the weapon might perhaps be used against Japan if the sanction of the United Nations (and of public opinion at home) were obtained, perhaps after a preliminary ultimatum to Japan to surrender or at least to evacuate certain regions as an alternative to their total destruction. This may sound fantastic, but in nuclear weapons we have something entirely new in order of magnitude of destructive power, and if we want to capitalize fully on the advantage their possession gives us, we must use new and imaginative methods.

It must be stressed that if one takes the pessimistic point of view and discounts the possibility of an effective international control over nuclear weapons at the present time, then the advisability of an early use of nuclear bombs against Japan becomes even more doubtful—quite independently of any humanitarian considerations. If an international agreement is not concluded immediately after the first demonstration, this will mean a flying start toward an unlimited armaments race. If this race is inevitable, we have every reason to delay its beginning as long as possible in order to increase our head start still further. It took us three years, roughly, under forced draft of wartime urgency, to complete the first stage of production of nuclear explosives—that based on the separation of the rare fissionable isotope $U^{235}$, or its utilization for the production of an equivalent quantity of another fissionable element. This stage required large-scale, expensive constructions and laborious procedures. We are now on the threshold of the second stage—that of converting into fissionable material the comparatively abundant common isotopes of thorium and uranium. This stage probably requires no elaborate plans and may provide us in about five or six years with a really substantial stockpile of atomic bombs. Thus it is to our interest to delay the beginning of the armaments race at least until the successful termination of this second stage. The benefit to the nation, and the saving of American lives in the future, achieved by renouncing an early demonstration of nuclear bombs and letting the other nations come into the race only reluctantly, on the basis of guesswork and without definite knowledge that the "thing does work," may far outweigh the advantages to be gained by the immediate use of the first and comparatively inefficient bombs in the war against Japan. On the other hand, it may be argued that without an early demonstration it may prove difficult to obtain adequate support for further intensive development of nucleonics in this country

and that thus the time gained by the postponement of an open armaments race will not be properly used. Furthermore one may suggest that other nations are now, or will soon be, not entirely unaware of our present achievements, and that consequently the postponement of a demonstration may serve no useful purpose as far as the avoidance of an armaments race is concerned, and may only create additional mistrust, thus worsening rather than improving the chances of an ultimate accord on the international control of nuclear explosives.

Thus, if the prospects of an agreement will be considered poor in the immediate future, the pros and cons of an early revelation of our possession of nuclear weapons to the world—not only by their actual use against Japan, but also by a prearranged demonstration—must be carefully weighed by the supreme political and military leadership of the country, and the decision should not be left to military tacticians alone.

One may point out that scientists themselves have initiated the development of this "secret weapon" and it is therefore strange that they should be reluctant to try it out on the enemy as soon as it is available. The answer to this question was given above—the compelling reason for creating this weapon with such speed was our fear that Germany had the technical skill necessary to develop such a weapon, and that the German government had no moral restraints regarding its use.

Another argument which could be quoted in favor of using atomic bombs as soon as they are available is that so much taxpayers' money has been invested in these Projects that the Congress and the American public will demand a return for their money. The attitude of American public opinion, mentioned earlier, in the matter of the use of poison gas against Japan, shows that one can expect the American public to understand that it is sometimes desirable to keep a weapon in readiness for use only in extreme emergency; and as soon as the potentialities of nuclear weapons are revealed to the American people, one can be sure that they will support all attempts to make the use of such weapons impossible.

Once this is achieved, the large installations and the accumulation of explosive material at present earmarked for potential military use will become available for important peace time developments, including power production, large engineering undertakings, and mass production of radioactive materials. In this way, the money spent on wartime development of nucleonics may become a boon for the peacetime development of national economy.

## IV. METHODS OF INTERNATIONAL CONTROL

We now consider the question of how an effective international control of nuclear armaments can be achieved. This is a difficult problem, but we think it soluble. It requires study by statesmen and international lawyers, and we can offer only some preliminary suggestions for such a study.

Given mutual trust and willingness on all sides to give up a certain part of their sovereign rights, by admitting international control of certain phases of national economy, the control could be exercised (alternatively or simultaneously) on two different levels.

The first and perhaps simplest way is to ration the raw materials—primarily, the uranium ores. Production of nuclear explosives begins with the processing of large quantities of uranium in large isotope separation plants or huge production piles. The amounts of ore taken out of the ground at different locations could be controlled by resident agents of the international Control Board, and each nation

**Analysis**

The preambule has been analyzed as a separate decision problem see Decision problem 2.

At the bottom of the first (page 140) two strategies are mentioned which are elaborated in the next pages:

S1 Keeping our discoveries secret for an indefinite time and S2 Developing our nucleonic armament at such a pace that no other nations would think of attacking us from fear of overwhelming retaliation

On page 141 the report describes why they think that S1 will not work. They believe that other nations have the same basic knowledge and can start develop their own nuclear bombs. So the conclusion is;

P11 it would be foolish to hope

O11 that this can protect us for more than a few years

P12 it is likely (implied)

O12 that the other nations start to develop their own nuclear bombs (Implied)

An intermediate discussion is presented about the possibility to prevent the other nations from developing nuclear weapons by a monopoly on the raw material of nuclear power. However this strategy is immediately rejected because Russia is so big that one can expect that they will also have large reserves of uranium. So this option is not taken seriously.

***Subtree for strategy S1***

S1; Keeping our discoveries secret for an indefinite time

P11 foolish to hope — p12 is likely

O11 protect us for more than a few years — o12 arms race

Then they go on with the second strategy:

S2 Developing our nucleonic armament at such a pace that no other nations would think of attacking us from fear of overwhelming retaliation

O21 the accumulation of a large number of bigger and better atomic bombs

P21 can, if produced at the maximum capacity in peace-time

P22 can (implied)

022 not lead to a large number of bigger and better atomic bombs

On page 142 the authors suggest that the reaction of possible other countries in case O211 would be

So: to attempt a sudden unprovoked blow simultaneously on all our major cities. The consequence could be

PSo1 the temptation will be overwhelming

0211 Destruction of a major part of our industry and a large part of our population, aggregated in densely populated metropolitan districts and no capacity for retaliation

P211 no doubt indicated (implied)

IT is of course also possible that

So2 the other nations will not do this

Ps02 small (Implied)

O212 no destruction (implied)

From the middle of the page 142 the report suggests a way to protect the US against such a first use of nuclear weapons by another nation is to move the industry and population from dense areas of 500 squared miles to less dense populated areas. They don´t believe that this can be done but" felt, however, that this dilemma had to be stated, to show what kind of alternative methods of protection will have to be considered if no successful international agreements are reached." They also mention that the US should start now if they want to realize this protection because they have maximally 10 years before the other nations will overcome our head start.

***The subtree for strategy S2***

S2 rapid development of nuclear weapons for retaliation

P21= can , if if produced at the Maximum capacity

p22= can

O21 the accumulation of many and better nuclear bombs

O22: no more weapons

Pso1= overwhelming Temptation

pso2= very small

So1: first strike on many places

So2 ; no first strike

p211 no doubt

p212= no doubt

O211= destruction of Industry and people No capacity for retaliation

O212= no destruction

On page 143 in the section III “prospects of agreement” they start with saying that probably other nations like Russia and China may be in a better position to create this protection than the US or countries in Europe but also for these countries it seems an impossible thing to do. Imagine to disintegrate cities like Moscow and St Petersburg. “Therefore, only lack of mutual trust and not lack of desire for agreement, can stand in the path of an efficient agreement for the prevention of nuclear warfare. The achievement of such an agreement will thus essentially depend on the integrity of intentions and readiness to sacrifice the necessary fraction of one´s own sovereignty, by all the parties of the agreement.”

Given this general idea the report considered two possible strategies to introduce the nuclear bomb in the international debate:

S3 use of the present nuclear bombs without warning on an appropriately selected object in Japan

P31 it is doubtful

O31 to break the will or ability of Japan to resist

P32 maybe (implied)

O32 break the resistance (implied)

P33 undoubtedly

O33 important tactical results

P34 may easily destroy all our chances

034 succes i.e. an international agreement (implied)

After that the report explains why this will happen because all countries will be shocked by the use of the weapon by the US and don´t trust the suggestion to abolish these weapons of the same country

After that the report discusses the effect on the public opinion in the US

P311=p321 it is not at all certain

0311=o321 approve of our own country being the first to introduce such a weapon

Implied is that these consequences can also not occur

P312=p322= 1-p311

O312=o322= no approval of our country

So they summarize that the advantages of use of the bomb **may be outweighed** by the ensuing loss of confidence and by a wave of horror an repulsion sweeping over the rest of the world and perhaps dividing public opinion at home.

This suggests that the utility of this strategy is negative although the immediate results in the war are positive but the negative effects on the trust and the possible agreement are larger

***The subtree for strategy S3***

S3 use of the present bombs in Japan

P31= it is doubtful

p32= may be

O31= break resistance of Japan

o32; no break of resistance

P311= not at all sure

p312 = not so sure

P321= not at all sure

p322 = not so sure

O311=approval of the US public

p312 = disapproval of the US public

O321=approval of the US public

p322= disapproval of the US public

For all branches add

P33= undoubtedly

O33= important tactical results

P34= may easily destroy all our chances

O34= an international agreement

Overall the results of this strategy are evaluated as negative because they say: "the advantages of use of the bomb **may be outweighed** by the ensuing loss of confidence and by a wave of horror an repulsion sweeping over the rest of the world and perhaps dividing public opinion at home."

On page 144 third section starts the discussion of the 4th strategy.

***If the atmosphere is such that an agreement with control is possible*** the S4 should be tried

S4 A demonstration of the new weapon before the eyes of representatives of all the United Nations on the desert or a barren island combined with a statement " You see what sort of weapon we had but did not use. We are ready to renounce its use in the future if other nations join us in this renunciation and agree to the establishment of an efficient international control."

P41= the best possible atmosphere could be achieved

041= achievement of an international agreement

The text goes on with a bizarre perspective that one even gets permission to use the weapon in the war after a warning in a deserted area in Japan. They assume that

P411possibly with sanction of the UN

o411 use of the weapon against Japan

But they should also realize

P42 possible (implied)

O42 no immediate international agreement (implied)

P421=1 (implied)

O421= armsrace (implied)

***Subtrees for strategy S4***

S4 Demo immediately in desert

P41= best possible p42= 1-p41

O41= agreement o42 no agreement

P411 p412 p421= 1

0411 demo in Japan no demo O421= armsrace

***If the atmosphere is such that an agreement with control is not possible*** then they evaluate strategy S5 and S6

**S5** Use of the bomb in Japan

P5=1= Will lead

O51 Humanitarian problems

O52 Immediate start of the armament race

***Sub tree Strategy S5***

S5 Use of the bomb in Japan

P5 will lead

O51 Humanitary problems

O52 Immediate start of the Arms race

**S6** delay the demonstration at all

P61 Possible

O41 an increase of our head start in the form of a stockpile of atomic bombs in 5 or 6 years

After that the report indicates its preferred choice: Thus it is to our interest to delay the beginning of the armaments race at least until the successful termination of the second stage (of development of nuclear weapons)

Then again an evaluation of the utility of the different outcomes is given

·"The benefit to the nation, and the saving of American lives in the future, achieving by renouncing an early demonstration of nuclear bombs and letting the other nations come in the race only reluctantly, on the basis of guesswork and without definite knowledge that the thing doe work may far outweigh the advantages to be gained by the immediate use of the first and comparatively inefficient bombs in the war against Japan"

After that the report suggest the possibility that there will be not enough support for the development of the weapons and so the advantage will not be obtained without a demonstration of the efficiency of the working of the bomb

P62 possible

062 no support for development and No head start

Then they suggest as well that possibly the armaments race is not prevented because due to the delay of the demonstration other nations don´t trust the US and start immediately with their research

P611=P621 Worsening the chances

O611=O621 ultimate accord on international control of nuclear weapons

P612=P622 increased chance

O612=O622 arms race

Finally they say why those who made the bomb are against immediate use and they suggest that the population may accept this decision not to use them now and also to support all attempts to make the use of these weapons impossible if their potentialities are demonstrated.

An agreement can only be realized if control can be organized. The last section discusses the way this can be organized. This is the topic of the next section

***Subtree for strategy S5***

S6 Delay the demonstration

P61=possible p62= possible

061 = head start o62= no head start

P611=worsening chances p612=increasing chances p621=p611 p622=p612

O611= agreement 0612= armsrace O621=o611 O622=o612

***Decision rule***

It seems to be clear that they want to prevent an arms race with as a possible consequence a total destruction of the world. But because of the complexity of the description of the decision problem with rank ordered utilities and rank ordered probabilities **there is no simple decision rule that can predict their choice.**

**Decision problem 4**

**Glen Seaborg to Ernest O Lawrence June 13 1945 .**

**Source Nuclearfiles.org**

June 13, 1945

June 13, 1945

Mr. Ernest 0. Lawrence
Radiation Laboratory
University of California
Berkeley, California

Dear Ernest:

I am writing to give you my opinions and suggestions on the question of the course to be taken for nuclear weapons in the immediate future, and also on the question of the post war future for neucleonics. My purpose is to express myself briefly here upon such political and social questions as the release of information, use of the weapon in the present war and post war control of the weapon, rather than upon the actual research program which would be difficult to cover in a short communication. As you know, it is difficult to express unqualified opinions on such political and social questions as these on the basis of information available to us, and therefore I have the feeling that my views could change if there is important information, espe-cially in respect to the present war, which is not at our disposal. I do want to say, however, that these present opinions are shared almost unanimously by the people associated with me in my section of the Chemistry Division here. For the purpose of brevity I shall list our conclusions with little or no discussion of the basis for the development of these conclusions. These opinions of course are based on the assumption that the development of a nuclear weapon of great destructive capacity is now essentially an accomplished fact.

I believe that the basic facts concerning the successful release of nuclear energy and its immense destructive possibilities should be made public and impressed upon public opinion in this country and all over the world very soon. There should be essentially two stages in the release of this information, disclosure to the general public of the results which have been obtained, and the publication of these results through more or less regular scientific channels. The first of these, disclosure to the public, should come soon and probably need go no further than to describe the destructive possibilities of the self-sustaining chain reaction with the heavy isotopes, with some non-technical description of the achievements in the manufacturing of such fissionable material. The method to be employed for this release should be chosen only after much careful study; perhaps a stepwise release, studying the effect at each step, should be used. The publication in regular scientific channels, which is not an urgent matter, should come later but should then go at least so far as to cover the entire scientific basis of the accomplishments. This would include such items as the existence of and the important nuclear properties of the heavy isotopes, the fundamental information about the nuclear chain reactions, the basic information concerned with the methods for the separation of the uranium isotopes, the fundamental information about chain-reacting structures used in the manufacture of the heavy synthetic isotopes, and the fundamental chemical properties of the new synthetic elements. Perhaps it would be all right to withhold indefinitely some of the information with respect to the actual detailed designs of the major manufacturing installations. This might not be construed as too unnatural a procedure in that the maintenance of secrecy in regard to ordnance infor-mation and in respect to many industrial operations has an established pre-cedent in this country.

With respect to use in the present war we suggest the following. Our country would probably lose some of the confidence of our Allies and dete-riorate our moral position with respect to the outlawing of future use of the weapon if we were to use it directly upon Japan without warning. It seems certain that the moral position of our country would be greatly strengthened if the first demonstration of this weapon were made upon some uninhabited island in the presence of the invited representatives of all the leading countries of the world, including Japan. Following such a successful demonstration Japan would be given an ultimatum to surrender and if this ultimatum was not accepted, the question of then using the weapon would be decided by the United States together with the United Nations; the sanction of other leading nations of the world would be important. The question of international control of this weapon, touched upon in the next paragraph, should of course be vigorously pursued immediately after the demonstration.

The question of the post war control of nucleonics is a most difficult one. The above-described disposition of the weapon in the present war amounts essentially to subordinating its use now toward the broader goal of insuring control over it in the longer post war future. One method of post war control lies in the complete outlawing of nucleonics research throughout the world; I believe that this method, which amounts to advocating the suppression of science, is too unnatural for it to succeed. We would favor, rather, if it could possibly be made consistent with our national security and with world secu-rity, free research in nucleonics throughout the world with complete ex-change of all the basic information and some degree of control through an international organization. Probably the best method of control lies in the control of the raw materials, although this is admittedly difficult. Completely free research in nucleonics, unfortunately, makes it possible for any country to accumulate a stockpile of fissionable material. It is the opinion of some that probably the only method of maintaining control under such conditions would involve world-wide pooling to form a stockpile of fissionable material to be

## Analysis

He presents in the first section why he writes this letter and indicates that this is the almost unanimous opinion of people associated with him in his section of the Chemistry division. He gives conclusions and not all details.
In the second section he suggest: “the basic facts concerning the successful release of nuclear energy and its immense destructive possibilities should be made public and impressed upon public opinion in this country and all over the world very soon”
Given the word “should” this text presents his preferred choice to inform the public but he does not give the arguments for this preference. Then he continuous to explain that it should be done in two steps, one for the public in general and one in the form of standard scientific publications. He also suggests that some information should not be presented about the production processes as it is not uncommon in industrial operations.

In the third section he discussed **the use of the atomic weapon** in the present war:
S1 is the use of the atomic weapon dire3ctly upon Japan without warning. The he expects:
(O11) “Our country would probably (p11) lose some of the confidence of our Allies and (O12) deteriorate our moral position with respect to the outlawing of future use of the weapon if (S1) we were to use it directly upon Japan without warning.
The fact that he says probably, implies that there is also a probability (p12) that this does not happen negation of O11 and O12

As alternative he suggests : (O21)It seems certain that the moral position of our country would be greatly strengthened if (S2) the first demonstration of this weapon were made upon some inhabited island in the presence of the invited representatives of all the leading countries of the world including Japan. Then he continues with this strategy in three steps: “Following such a successful demonstration (S22)Japan would be given an ultimatum to surrender and if (O211)this ultimatum was not accepted, (S23 the question of then using the weapon be decided by the US together with the UN. (O231The sanctions of the other leading nations would be important”
The question of international control of this weapon … should of course be vigorously pursued immediately after the demonstration.

Although he does not make his choice explicit, it is clear from the fact that he continuous with the problem of the control of the development of nuclear weapons that he prefers the second strategy.

After this section he continuous with the issue of the control of nuclear weapons which is a different issue that we ignore as not important for the decision problem about the use of the nuclear weapons at hat moment.

**Decision tree**

S1
Use of the atomic weapon directly
upon Japan without warning

P11=probably

p12= 1-probably

(O11) "Our country would lose some
of the confidence of our Allies
and
deterioration of our moral position
with respect to the outlawing of
future use of the weapon

012 no los of confidence
of our allies
and
no deterioration of our moral position
with respect to outlawing of
future use of the weapon

s2
1.The first demonstration of this weapon were made upon
some inhabited island in the presence of the invited representatives
of all the leading countries of the world including Japan.
2. ultimatum
3. use of the bomb

p2=Certain

(O21) the moral position of our country
would be greatly strengthened

s22
Ultimatum to Japan to surrender

P211=Possible

p212=possible

(O211) Ultimatum accepted

(O212) ultimatum not accepted

S23 use of the bomb against Japan

O23 support of the UN and other nations

**Decision table**

| | S1<br>Use of the atomic weapon directly upon Japan without warning | S2<br>1. Demo<br>2. Ultimatum<br>3. Use of the bomb |
|---|---|---|
| O11=Our country would lose some of the confidence of our Allies and deterioration of our moral position with respect to the outlawing of future use of the weapon | probably<br>– | |
| o12 Our country would NOT lose some of the confidence of our Allies and NO deterioration of our moral position with respect to the outlawing of future use of the weapon | 1.probably<br>+ | |
| O21= the moral position of the US greatly strengthened | | certain<br>+ |
| O22= ultimatum accepted | | possible<br>+ |
| O23= use of bomb with support of UN And other nations | | possible<br>+ |

**Decision Rule**

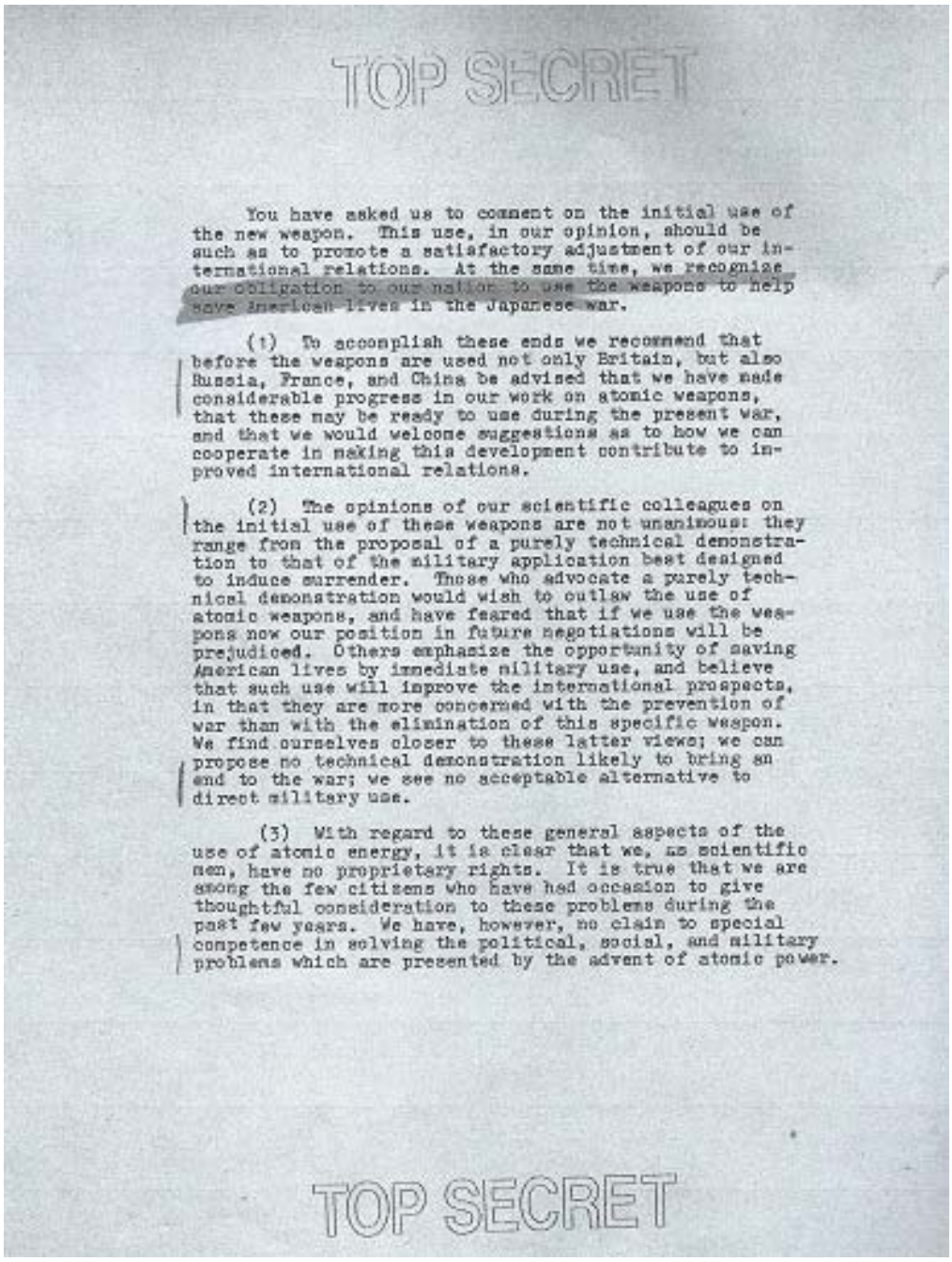
The Risk avoiding suggest the chosen strategy S2

**Decision problem 5**

**Recommendations of the scientific panel June 16 1945**
Author. J.R. Oppenheimer

Use of the nuclear bomb

Text in Stoff page 150



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You have asked us to comment on the initial use of the new weapon. This use, in our opinion, should be such as to promote a satisfactory adjustment of our international relations. At the same time, we recognize our obligation to our nation to use the weapons to help save American lives in the Japanese war.

(1) To accomplish these ends we recommend that before the weapons are used not only Britain, but also Russia, France, and China be advised that we have made considerable progress in our work on atomic weapons, that these may be ready to use during the present war, and that we would welcome suggestions as to how we can cooperate in making this development contribute to improved international relations.

(2) The opinions of our scientific colleagues on the initial use of these weapons are not unanimous: they range from the proposal of a purely technical demonstration to that of the military application best designed to induce surrender. Those who advocate a purely technical demonstration would wish to outlaw the use of atomic weapons, and have feared that if we use the weapons now our position in future negotiations will be prejudiced. Others emphasize the opportunity of saving American lives by immediate military use, and believe that such use will improve the international prospects, in that they are more concerned with the prevention of war than with the elimination of this specific weapon. We find ourselves closer to these latter views; we can propose no technical demonstration likely to bring an end to the war; we see no acceptable alternative to direct military use.

(3) With regard to these general aspects of the use of atomic energy, it is clear that we, as scientific men, have no proprietary rights. It is true that we are among the few citizens who have had occasion to give thoughtful consideration to these problems during the past few years. We have, however, no claim to special competence in solving the political, social, and military problems which are presented by the advent of atomic power.

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## Analysis

Section 1 gives an introduction.

Section 2 makes an argument that whatever will be decided, the countries Britain , Russia, France and China should be informed about the development in this field and that suggestions would be welcome how we can cooperate in making this development contribute to improved international relations.

There are no arguments given for this strategy so we do not include this part in the decision problem. The decision problem starts in the next section. He starts to say that there is no unanimous opinion in the scientific community. The opinions range from:

S1 a purely technical demonstration to S2 a military application best designed to induce surrender

Those who advocate S1 would wish to (O11) outlaw the use of nuclear weapons and have feared that if we use the weapons now (O21) our position in the future negotiations will be prejudiced.

Others emphasize (022) the opportunity of saving American lives (by immediate military use) and that such use (O23) will improve the international prospects (of prevention of war)

The latter are “more concerned with the prevention of war than with the elimination of this specific weapon”

Then he suggests the inclination of the committee to the last opinion.

In the last section he confesses that as scientists they had no special knowledge about the issues about the use of general aspects of atomic energy.

**Decision tree**

| **S1** | **S2** |
|---|---|
| a purely technical demonstration | a military application best designed to induce surrender |
| (O11) outlaw the use of nuclear weapons | (O21) our position in the future negotiations will be prejudiced.<br>(022) the opportunity of saving American lives<br>(O23) will improve the international prospects to prevent war |

When we assume that both groups accept the presented structure of the problem there is no solution for this decision problem unless one makes an evaluation of the utilities of the consequences of the two strategies. That is indeed the case:

Those who see outlawing the use of nuclear weapons as more important than the outcomes of the use of the weapons now chose S1

Those who see prevention of war as more important prefer strategy S2

The **Decision table** is the same as the decision tree

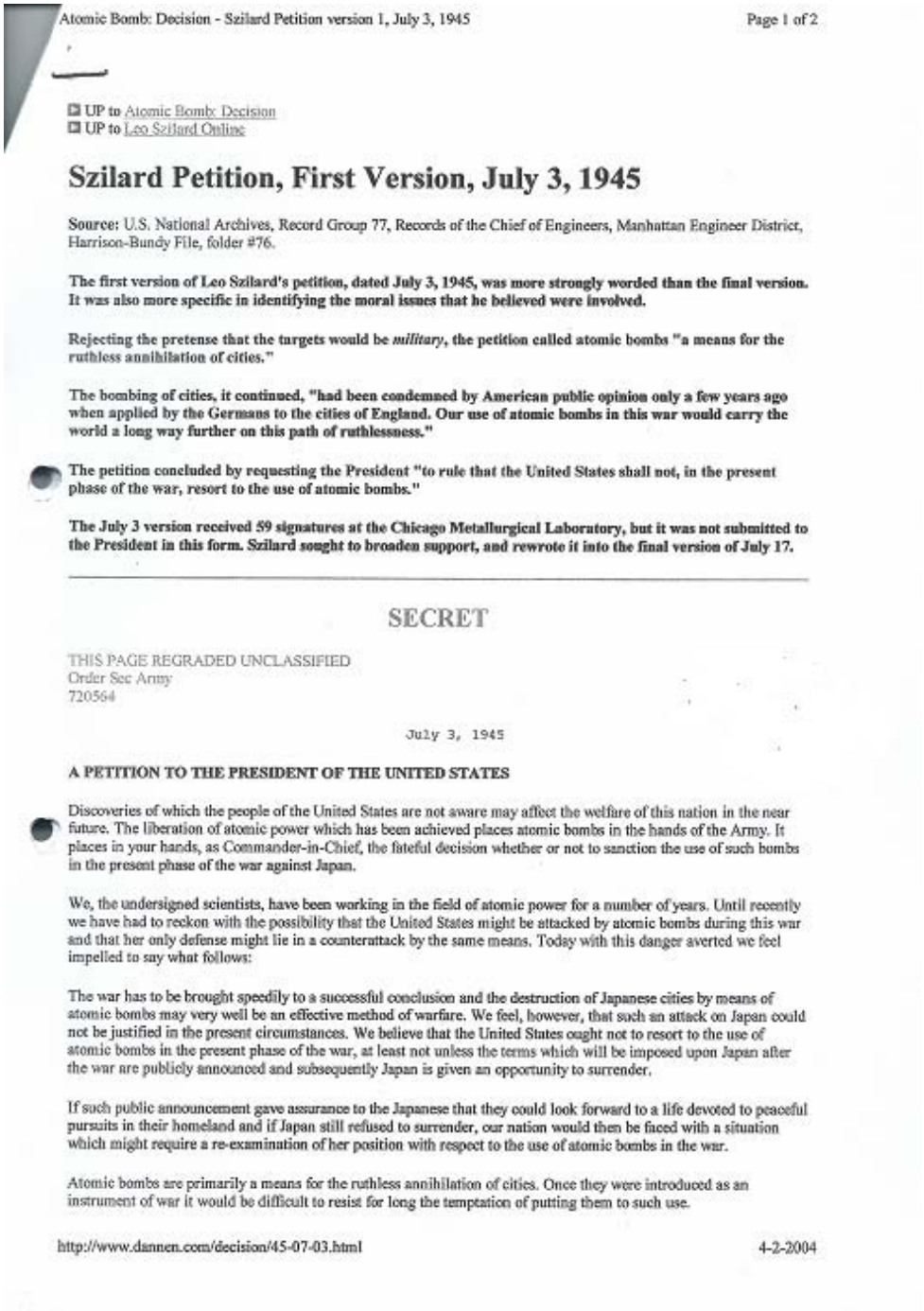
Oppenheimer suggests that both groups use a **lexicographic rule** to come to their choice

**Decision problem 6**

**A petition to the president of the United States (first version) July 3 1945**
Author. L.Szilard

Use of the nuclear bomb

Source US National Archives, Record Group 77





UP to Atomic Bomb: Decision
UP to Leo Szilard Online

## Szilard Petition, First Version, July 3, 1945

**Source:** U.S. National Archives, Record Group 77, Records of the Chief of Engineers, Manhattan Engineer District, Harrison-Bundy File, folder #76.

**The first version of Leo Szilard's petition, dated July 3, 1945, was more strongly worded than the final version. It was also more specific in identifying the moral issues that he believed were involved.**

**Rejecting the pretense that the targets would be *military*, the petition called atomic bombs "a means for the ruthless annihilation of cities."**

**The bombing of cities, it continued, "had been condemned by American public opinion only a few years ago when applied by the Germans to the cities of England. Our use of atomic bombs in this war would carry the world a long way further on this path of ruthlessness."**

**The petition concluded by requesting the President "to rule that the United States shall not, in the present phase of the war, resort to the use of atomic bombs."**

**The July 3 version received 59 signatures at the Chicago Metallurgical Laboratory, but it was not submitted to the President in this form. Szilard sought to broaden support, and rewrote it into the final version of July 17.**

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SECRET

THIS PAGE REGRADED UNCLASSIFIED
Order Sec Army
720564

July 3, 1945

**A PETITION TO THE PRESIDENT OF THE UNITED STATES**

Discoveries of which the people of the United States are not aware may affect the welfare of this nation in the near future. The liberation of atomic power which has been achieved places atomic bombs in the hands of the Army. It places in your hands, as Commander-in-Chief, the fateful decision whether or not to sanction the use of such bombs in the present phase of the war against Japan.

We, the undersigned scientists, have been working in the field of atomic power for a number of years. Until recently we have had to reckon with the possibility that the United States might be attacked by atomic bombs during this war and that her only defense might lie in a counterattack by the same means. Today with this danger averted we feel impelled to say what follows:

The war has to be brought speedily to a successful conclusion and the destruction of Japanese cities by means of atomic bombs may very well be an effective method of warfare. We feel, however, that such an attack on Japan could not be justified in the present circumstances. We believe that the United States ought not to resort to the use of atomic bombs in the present phase of the war, at least not unless the terms which will be imposed upon Japan after the war are publicly announced and subsequently Japan is given an opportunity to surrender.

If such public announcement gave assurance to the Japanese that they could look forward to a life devoted to peaceful pursuits in their homeland and if Japan still refused to surrender, our nation would then be faced with a situation which might require a re-examination of her position with respect to the use of atomic bombs in the war.

Atomic bombs are primarily a means for the ruthless annihilation of cities. Once they were introduced as an instrument of war it would be difficult to resist for long the temptation of putting them to such use.

The last few years show a marked tendency toward increasing ruthlessness. At present our Air Forces, striking at the Japanese cities, are using the same methods of warfare which were condemned by American public opinion only a few years ago when applied by the Germans to the cities of England. Our use of atomic bombs in this war would carry the world a long way further on this path of ruthlessness.

Atomic power will provide the nations with new means of destruction. The atomic bombs at our disposal represent only the first step in this direction and there is almost no limit to the destructive power which will become available in the course of this development. Thus a nation which sets the precedent of using these newly liberated forces of nature for purposes of destruction may have to bear the responsibility of opening the door to an era of devastation on an unimaginable scale.

In view of the foregoing, we, the undersigned, respectfully petition that you exercise your power as Commander-in-Chief to rule that the United States shall not, in the present phase of the war, resort to the use of atomic bombs.

**Leo Szilard and 58 co-signers**

[Source for number of signers of July 3 petition: Szilard to Frank Oppenheimer, July 23, 1945, Robert Oppenheimer Papers, Library of Congress, Washington D.C.]



UP to Atomic Bomb: Decision
UP to Leo Szilard Online

URL: http://www.dannen.com/decision/45-07-03.html
*Gene Dannen / gene@dannen.com*

**Analysis**

Section 1 gives an introduction why he writes to the president who has to decide about the use of the bomb

Section 2 mentions that the bomb was developed because of fear of the use of this weapon by Germany. This danger does not exist anymore.

Then he suggests the following strategies:

S1 the destruction of Japanese cities by means of atomic bombs may very well be an effective method of warfare. We feel however, that such an attack on Japan could not be justified in the present circumstances.

We believe that the US ought not to resort to the use of atomic bombs in the present phase of the war, at least not unless

S2 the terms which will be imposed upon Japan after the war are publicly announced and subsequently Japan is given an opportunity to surrender.

(p21)If Japan still(O22) refused to surrender our nation would then be faced with a situation which might require a re-examination of her position with respect to the (S21)use of the atomic bombs in the war.

This implies that Japan can also surrender (O21) and then the use of the bomb is not necessary.

The next section mentioned that the bomb is mainly made for destruction of cities and type of warfare that was condemned by the American public when the Germans were doing this to cities in England.

The text goes on that the atomic bombs at our disposal represent only the first step in this direction and there is almost no limit to the destructive power which will become available in the course of the development.

Thus a nation which sets the precedent of using these newly liberated forces of nature for purposes of destruction (p)may have to bear (O11)the responsibility of opening the door to an era of devastation on an unimaginable scale.

Finally he suggest the present not to resort to the use of atomic bombs

**Decision tree**

S1 use of atomic bombs in Japan

P1=May

p2=may not

O111: Japan surrenders

O112 no surrender

O121 responsible of opening the door to an era of devastation on an unimaginable scale

O122 =O121

S2 An ultimatum to Japan
+ use of the bomb if necessary

O21 Japan surrenders

O212:1Japan does not surrender

+
O22 No Responsibility for devastation

S21 Use of the atomic bomb

O222 Japan surrenders +

O222 Responsible for devastation _

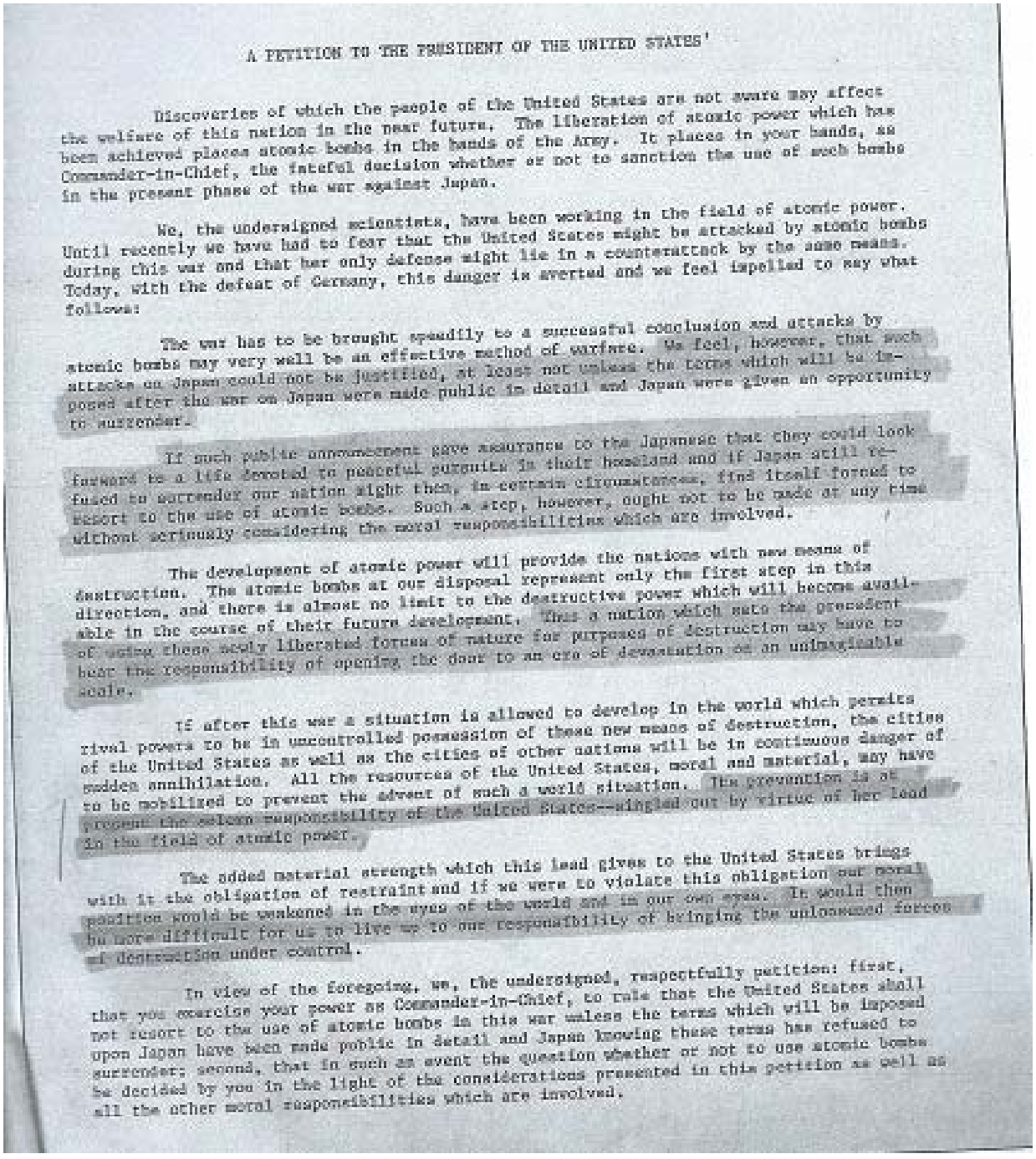
It is not clear which rule determines the preferred strategy S2

**Decision problem 7**

**A petition to the president of the United States (second version) July 17 1945**
Author. L.Szilard

Use of the nuclear bomb

Source: Stoff document 62



A PETITION TO THE PRESIDENT OF THE UNITED STATES'

Discoveries of which the people of the United States are not aware may affect the welfare of this nation in the near future. The liberation of atomic power which has been achieved places atomic bombs in the hands of the Army. It places in your hands, as Commander-in-Chief, the fateful decision whether or not to sanction the use of such bombs in the present phase of the war against Japan.

We, the undersigned scientists, have been working in the field of atomic power. Until recently we have had to fear that the United States might be attacked by atomic bombs during this war and that her only defense might lie in a counterattack by the same means. Today, with the defeat of Germany, this danger is averted and we feel impelled to say what follows:

The war has to be brought speedily to a successful conclusion and attacks by atomic bombs may very well be an effective method of warfare. We feel, however, that such attacks on Japan could not be justified, at least not unless the terms which will be imposed after the war on Japan were made public in detail and Japan were given an opportunity to surrender.

If such public announcement gave assurance to the Japanese that they could look forward to a life devoted to peaceful pursuits in their homeland and if Japan still refused to surrender our nation might then, in certain circumstances, find itself forced to resort to the use of atomic bombs. Such a step, however, ought not to be made at any time without seriously considering the moral responsibilities which are involved.

The development of atomic power will provide the nations with new means of destruction. The atomic bombs at our disposal represent only the first step in this direction, and there is almost no limit to the destructive power which will become available in the course of their future development. Thus a nation which sets the precedent of using these newly liberated forces of nature for purposes of destruction may have to bear the responsibility of opening the door to an era of devastation on an unimaginable scale.

If after this war a situation is allowed to develop in the world which permits rival powers to be in uncontrolled possession of these new means of destruction, the cities of the United States as well as the cities of other nations will be in continuous danger of sudden annihilation. All the resources of the United States, moral and material, may have to be mobilized to prevent the advent of such a world situation. The prevention is at present the supreme responsibility of the United States--singled out by virtue of her lead in the field of atomic power.

The added material strength which this lead gives to the United States brings with it the obligation of restraint and if we were to violate this obligation our moral position would be weakened in the eyes of the world and in our own eyes. It would then be more difficult for us to live up to our responsibility of bringing the unleashed forces of destruction under control.

In view of the foregoing, we, the undersigned, respectfully petition: first, that you exercise your power as Commander-in-Chief, to rule that the United States shall not resort to the use of atomic bombs in this war unless the terms which will be imposed upon Japan have been made public in detail and Japan knowing these terms has refused to surrender; second, that in such an event the question whether or not to use atomic bombs be decided by you in the light of the considerations presented in this petition as well as all the other moral responsibilities which are involved.

**Analysis**

Section 1 gives an introduction why he writes to the president who has to decide about the use of the bomb
Section 2 mentions that the bomb was developed because of fear of the use of this weapon by Germany. This danger does not exist anymore.
From section 3 onwards he develops his suggestions with respect to the use of the bomb

S1 The use of atomic bombs

Effective

+To bring the war to an end

(Arms race)
_All cities will be in danger of sudden annihilation
_Responsibility of opening the door for devastation on unimaginable scale
_our moral position would be weakened
_More difficult to bring the forces of destruction Under control

S2 Provide Japan with an ultimatum
To surrender

Possible

+ surrender

possible

_ no surrender

S21 Use of atomic bombs

+Japan surrenders

_ (Arms race)
_ All cities will be in danger of sudden annihilation
_Responsibility of opening the door for devastation on unimaginable scale
_our moral position would be weakened
_More difficult to bring the forces of destruction Under control

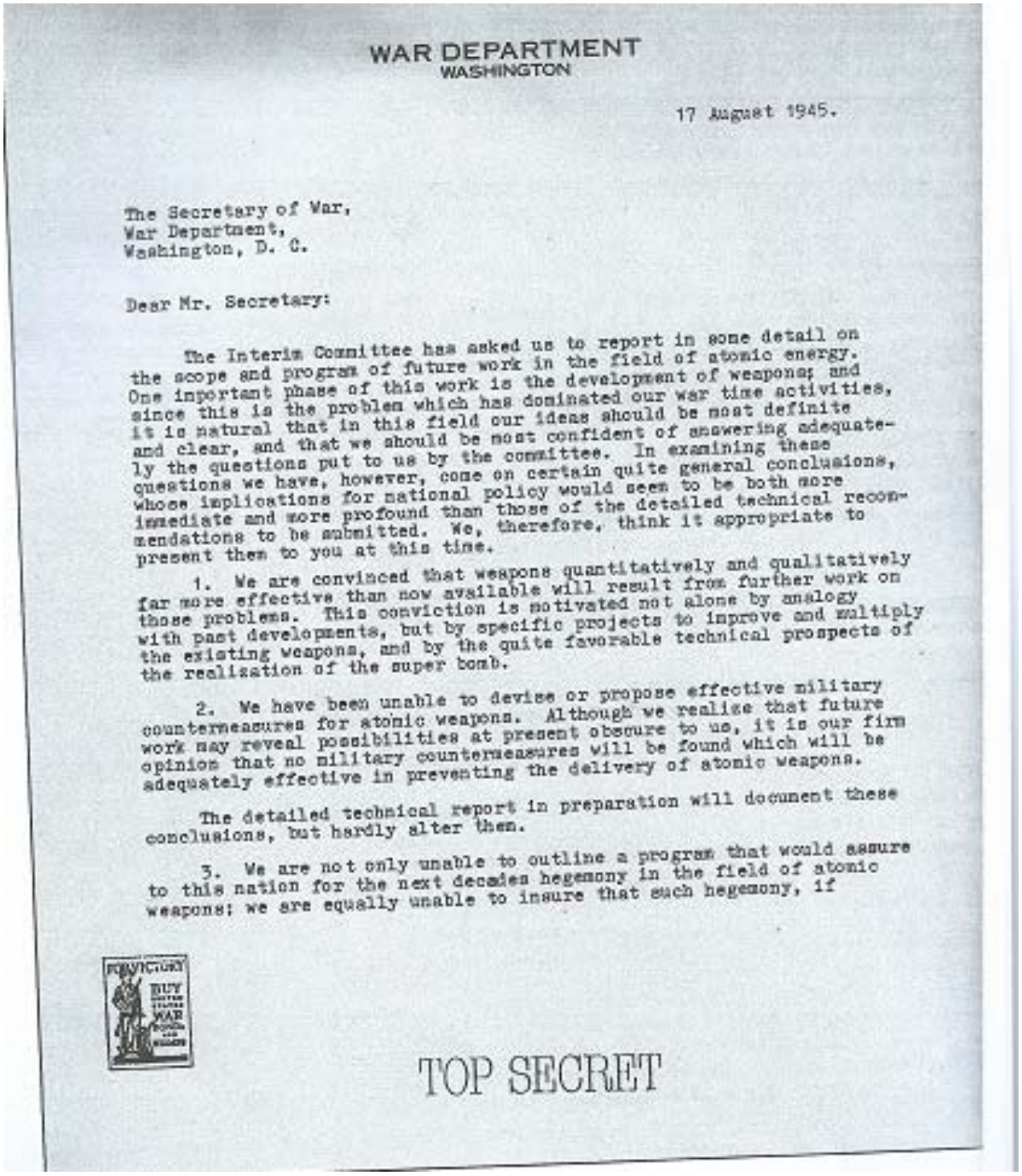
**Decision rule**
The reversed Simon rule predicts this choice.

**Decision problem 8**

**Lettre to the secretary of War of the US August 17 1945**
Author. R.Oppenheimer

Future developments

Source: Stoff document 89



WAR DEPARTMENT
WASHINGTON

17 August 1945.

The Secretary of War,
War Department,
Washington, D. C.

Dear Mr. Secretary:

The Interim Committee has asked us to report in some detail on the scope and program of future work in the field of atomic energy. One important phase of this work is the development of weapons; and since this is the problem which has dominated our war time activities, it is natural that in this field our ideas should be most definite and clear, and that we should be most confident of answering adequately the questions put to us by the committee. In examining these questions we have, however, come on certain quite general conclusions, whose implications for national policy would seem to be both more immediate and more profound than those of the detailed technical recommendations to be submitted. We, therefore, think it appropriate to present them to you at this time.

1. We are convinced that weapons quantitatively and qualitatively far more effective than now available will result from further work on those problems. This conviction is motivated not alone by analogy with past developments, but by specific projects to improve and multiply the existing weapons, and by the quite favorable technical prospects of the realization of the super bomb.

2. We have been unable to devise or propose effective military countermeasures for atomic weapons. Although we realize that future work may reveal possibilities at present obscure to us, it is our firm opinion that no military countermeasures will be found which will be adequately effective in preventing the delivery of atomic weapons.

The detailed technical report in preparation will document these conclusions, but hardly alter them.

3. We are not only unable to outline a program that would assure to this nation for the next decades hegemony in the field of atomic weapons; we are equally unable to insure that such hegemony, if

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achieved, could protect us from the most terrible destruction.

4. The development, in the years to come, of more effective atomic weapons, would appear to be a most natural element in any national policy of maintaining our military forces at great strength; nevertheless we have grave doubts that this further development can contribute essentially or permanently to the prevention of war. We believe that the safety of this nation - as opposed to its ability to inflict damage on an enemy power - cannot lie wholly or even primarily in its scientific or technical prowess. It can be based only on making future wars impossible. It is our unanimous and urgent recommendation to you that, despite the present incomplete exploitation of technical possibilities in this field, all steps be taken, all necessary international arrangements be made, to this one end.

5. We should be most happy to have you bring these views to the attention of other members of the Government, or of the American people, should you wish to do so.

Very sincerely,

J R Oppenheimer
For the Panel

## Analysis

Section 1 gives an introduction why he writes this letter and why he will provide very general principles instead of more specific technical ones. These general principles are:

1. That weapons quantitatively and qualitatively far more effective than the now available will result from further work on those problems. (then follows why he thinks so)
2. No military countermeasures will be found which will be adequately effective in preventing the delivery of atomic weapons
3. We are not only unable to guarantee hegemony for the next decades , we are equally unable to insure that such hegemony , if achieved , could protect us from the most terrible destruction

In point 4 finally the decision problem and the suggested strategy is mentioned:

S1 development of more effective atomic weapons
P11 grave doubts
011 contribute essentially and permanently to the prevention of war

He explains then why he thinks so. Then he continues

S2 All necessary international arrangement be made to make future wars impossible
P2 Can be based only
02 safety of our nation

The latter is the strategy recommended unanimously by the scientific panel

**Decision tree**

S1 development of more effective atomic weapons

| | |
|---|---|
| P11 grave doubts | p12 =likely |
| 011 contribute essentially and permanently to the prevention of war | 012 No contribution to essentially and permanently prevention of war |

S2 All necessary international arrangement be made to make future wars impossible

P2 only basis

02 safety of our nation

**The Decision rule:**
Risk avoiding rule because p2>p11 will lead to the choice of S2.

Summary of the results

| | Nominal Probabilities | rankordered probabilities |
|---|---|---|
| Nominal Utitilties | 6,7 | 2,4,8 |
| Rankordered Utilities | 1,5 | 3 |

| Decision rules | decision problem |
|---|---|
| Reversed Simon | 7 |
| Risk avoiding | 2,4,8 |
| Lexicographic | 1,5 |
| No rule | 3,6 |

Decision problem 6 is specified with positive and negative outcomes and there is no evaluation given of these outcomes which is done later in decision problem 7 by the same decision maker.

Decision problem 3 has been specified with rank ordered probabilities and rank ordered utilities and due to that there is no simple rule to predict the preferred choice.