

# **THE NUCLEAR TIME BOMB**

**Assessing Accidental Nuclear War Dangers  
Through The Use Of Analytical Models**

**by**

**Dean Babst and Robert Aldridge**

**A Report of the Nuclear Age Peace Foundation's  
Accidental Nuclear War Prevention Project**

**Nuclear Age Peace Foundation  
1187 Coast Village Road, Suite 123  
Santa Barbara, CA 93108**

**May 1986**

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1187 Coast Village Road, Suite 123 • Santa Barbara, CA 93108 • (805) 969-9137

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We are constantly reminded that humans do not create perfect systems. In recent times we have been confronted by the Challenger tragedy, the unexpected explosion of a Titan missile shortly after take-off from Vandenberg Air Force Base, and the major accident at the Chernobyl nuclear power plant near Kiev in the Soviet Union.

We also frequently find that statistical improbabilities become realities such as a single individual winning two separate jackpots in a state lottery. In other words, things that aren't supposed to happen, do happen -- and much more frequently than most of us would like. It is with this understanding that this paper should be read.

The authors point out the serious nature of the risk of accidental nuclear war -- what they call "The Nuclear Time Bomb". It is a situation that cries out for public education and involvement. We are offered an opportunity here to evaluate the risks which we face, and respond as citizens in a great democracy to lessening those risks and creating a safer world.

I urge you to read this paper, and become active in confronting this issue. Here are some of the things you can do:

- Call or write your Congressional representatives, and ask them what they are doing to solve this problem.
- Encourage your local television and radio stations to carry educational programs on accidental nuclear war dangers.
- Write a letter to the editor of your local newspaper expressing your concern.
- Contact the Nuclear Age Peace Foundation and ask to receive the International Accidental Nuclear War Prevention Newsletter.

Your help is needed to reduce the danger of accidental nuclear war, and achieve a peaceful future.

David Krieger  
President  
Nuclear Age Peace Foundation

# THE NUCLEAR TIME BOMB

Dean Babst and Robert Aldridge

## I. A. PURPOSE

**The arms race is a NUCLEAR TIME BOMB.** The danger of a nuclear war triggering itself is growing as nuclear weapons become more complex, automated and widespread; and as decision time decreases.

Since many people assume the arms race can go on indefinitely, it is crucial that this widely held assumption be rigorously assessed. This booklet shows how the peril of a nuclear war triggering itself by accident or miscalculation is growing. It is done by providing in summary form each of many studies being published in a larger book, *THE NUCLEAR TIME BOMB*. \* This booklet follows the same organization as the book.\*\*

## Predispositions

Accidents do not just happen. Dr. David Krieger, President of the Nuclear Age Peace Foundation, in the book's Foreword, describes how the world is steadily building a NUCLEAR TIME BOMB by creating the predisposing factors toward an accidental nuclear war. Consider the following:

1. As the opportunities grow for more nations, revolutionaries and terrorists to acquire nuclear weapons and as chain of command structures grow longer, the greater is the chance of a nuclear explosion occurring somewhere. Judging from the reaction to terrorist attacks at the Rome and Vienna airports, an unauthorized nuclear explosion could trigger an uncontrolled crisis.

2. As nations' weapons become more accurate and powerful (first strike capable), the advantage in striking first increases, and the more jittery each side becomes. The more edgy military leaders become, the easier a misunderstanding could trigger a missile launch.

3. As decision time decreases (now as little as 6 minutes), less time is allowed for missile launch decisions. This means a greater chance for errors. "Star Wars", with its layered defense, could reduce decision time still further as well as make the war decision process exceedingly complex.

4. Nations' **nuclear buttons** are being increasingly controlled by complex, never-fully-tested computer systems which could be frequently called upon to decide our fate. For example, Donald C. Latham, U.S. Assistant Secretary of Defense, said that "The modernization of our defense systems is resulting in a tremendous growth in automation that is being incorporated into military operations at all levels...."(1). **As the trend increases, the chance of some nation's miscalculation setting off World War III grows.** A Soviet missile's errant flight over Norway shows us that miscalculations can occur. The space shuttle Challenger's tragedy vividly demonstrates how accidents can unexpectedly occur.

5. **Perhaps even more dangerous than these factors is the lack of awareness among many leaders that the predispositions to accidental nuclear war are growing.** A lack of awareness of the problem results in relative satisfaction with the status quo ("We haven't had a nuclear war for forty years, have we?"), and complacency about change.

## Growing Realization

Fortunately there is a growing awareness, among many, that the arms race is a "Nuclear Time Bomb". The purpose of this booklet and the book is to accelerate awareness. **No one nation alone can reverse the arms race.** The better all nations understand that the arms race is a "booby trap", the more willing all should be to work vigorously for arms reduction and prevention measures. There are hopeful signs that the world is becoming increasingly aware that we are creating a Nuclear Time Bomb with many fuses. Consider the following:

1. In a 1984 U.S. opinion survey 69% of the public thought the most likely way a war would start is by accident, mistake or escalation of a local conflict into an unintentional nuclear war (2). For more than 30 years prior to this survey there was so little public awareness of inadvertent war as a serious danger that the question was not even asked in American and European surveys (3).

2. The current large scale arms reduction talks under way between the U.S. and Soviets are

\**THE NUCLEAR TIME BOMB: Assessing Accidental Nuclear War Dangers Through Use Of Analytical Models*, by Dean Babst and Robert Aldridge in collaboration with Linn Sennott, eds, Peace Research Institute, 25 Dundana Avenue, Dundas, Ontario, Canada L9H 4E5. Price U.S. \$10.

\*\*Each summary is identified with the same subsection (i.e. II.A., II.B. etc.) as the corresponding study in the book.

encouraging. President Reagan and General Secretary Gorbachev agreed to "push for more concrete steps to reduce the risk of an accidental nuclear war"(4). 3. Former President Nixon said the most likely way a war could start is "by accident, where one side launches a nuclear attack because a mechanical malfunction creates the mistaken impression that the other side has launched an attack"(5). He also describes three other ways a nuclear war could occur by mistake and says the least likely danger is a direct attack since that would be the same as suicide.

4. Robert Muller, Assistant Secretary-General of the United Nations said, "An utmost priority should be given in Geneva to every needed cooperation between the two countries for the avoidance of nuclear war by accident. The world needs to be given a guarantee that at least the ultimate folly, namely an annihilation of life from this planet by accident, will be avoided"(6).

5. Efforts to reduce the risk of an accidental war are making progress. The U.S. and U.S.S.R. agreed to improve the "hotline". They also agreed to work toward creating joint crisis control centers. The 35-nation Conference on Disarmament in Europe is seriously considering ways to reduce the danger of a nuclear war through miscalculation and misinterpretation(7).

### **Prevention Strategy**

While awareness is increasing and encouraging steps are being taken, the world still has a long way to go before it can feel secure. In order to gain support on a worldwide basis for the further changes that are needed, the Nuclear Time Bomb studies need to be widely publicized.

It is proposed that a pattern of studies similar to those which raised the "nuclear winter" effect be used to raise the "nuclear time bomb" threat. The "nuclear winter" studies assess the totality of the peril and the "nuclear time bomb" studies will examine the urgency of the danger and how it can be prevented.

The "nuclear winter" studies provide an excellent example of how scientists are affecting the arms race. Scientists asked whether a nuclear war could cover the world with ice. Using computer models, they were able to demonstrate the danger forcefully enough in their reports and conferences to obtain worldwide attention (8). They projected the danger forcefully enough to spark serious consideration in arms reduction discussions and to get more studies started. For example, The Scientific Committee on Problems of the Environment, which is composed of scientists from a dozen countries, including the Soviet Union and the United States, is expanding its studies. The U.S. government is conducting an inter-agency investigation of the issue.

The "nuclear time bomb" studies can add to the public's understanding of the accidental nuclear war threat. They can complement not only the "nuclear winter" danger, but the Physicians for Social Responsibility's "Last Epidemic" concern, the ozone depletion theory and the other hideous eventualities nuclear weapons pose for us all.

### **Assessment Studies**

In order to show how accidental nuclear war assessment studies can be done, *THE NUCLEAR TIME BOMB* book presents the work of many established scientists from around the world. Their studies use the rigorous logic of mathematics in analytical models to project the urgency of the danger so that we (humanity) can reverse our direction while there is still time. This booklet provides a nontechnical summary of these studies' findings.

Using analytical models to assess the "time bomb" nature of the arms race can have many advantages:

- **Anticipate Dangers** - The studies can assess possible accidental war dangers before proposed major changes are made in policies or weapons systems.
- **Quick Answers** - The analytical models can be quickly run and rerun on computers as additional information or options become available or as new questions arise.
- **Small Cost** - The studies can be done at very small cost, possibly within current budgets and using existing computer equipment. Lt. Marsh's study at the U.S. Naval Postgraduate School is an excellent example (III.C. below).
- **Friendly Act** - Sharing the findings and procedures of studies can be a friendly act to all by alerting everyone to common dangers. The studies will not be harmful to anyone.

### **Accidental War Assessment Centers**

While accidental nuclear war is one of the world's greatest dangers, virtually no funds are being allocated anywhere to study how to prevent it. In order to carry out analytical model studies commensurate with the size, complexity, and urgency of the danger, small but sustained funding is needed. It is urged that all nations create their own Accidental War Assessment Center so they can evaluate the dangers for themselves(9).

**Establishing Accidental War Assessment Centers is a powerful positive action that non-nuclear-states can take to improve their security.** The late Prime Minister of Sweden, Olof Palme, giving the "Introductory Address" at an international accidental war conference, describes forcefully the helpless feeling of non-nuclear nations. "We the non-nuclear-weapons states, have an equal right to be masters of our own destiny. This right is being circumscribed by the threat of use of weapons which would bring death and destruction to all people. And we can never accept an order which in a way resembles a colonial system where the ultimate fate of other nations is determined by a few dominant nuclear powers"(10). He might well have added, "where the fate of all might be determined by mistake or accident." In addition, he said this is the main message in the Delhi Declaration, the statement issued at the six nation summit on nuclear disarmament(11). The Prime Minister in many respects expressed the impotent feeling of most people in the nuclear-nations as well.

**The very act of a growing number of nations creating Accidental War Assessment Centers could cause the world to become more aware of the peril.** Especially, if the creation of a Center is announced by a high official and has an impressive advisory council. It is hoped that some private and international organizations will also join in carrying out assessment studies. Such studies could provide invaluable insights into a complex subject when time is crucial.

After the space shuttle Challenger tragedy, a Commission was established to study what caused the accident. After an accidental nuclear war, there would be no one to form a commission to study what caused it. Wouldn't it be far better to establish study groups to evaluate what could cause an accidental war before it happens and then work vigorously to prevent it?

### **Accidental War Information Exchange**

In order to help Assessment Centers get started and develop as rapidly as possible, the Nuclear Age Peace Foundation is creating an Accidental War Information Exchange. Some preliminary ideas on how the Information Exchange will function are as follows:

- **Coordinating Service** - The Exchange will strive to expedite the flow of information between the Assessment Centers and interested persons. It will receive and catalogue studies and provide information upon request as time and resources permit. Also it will report strategic information quarterly in the *International Accidental Nuclear War Prevention Newsletter* produced jointly by the Foundation and The Richardson Institute for Conflict & Peace Research, Department of Politics, University of Lancaster, Lancaster, England LA1 4YF. The Institute handles European and Asian news gathering and distribution of the Newsletter while the Foundation handles other areas.
- **Build On Existing Information Centers** - The many coauthors of the book are associated with growing information centers that could provide a modest start for analytical modeling data, e.g. Nuclear Age Peace Foundation; University of Michigan; University of Lancaster, England; Massachusetts Institute of Technology; Peace Research Institute, Canada. In addition, there are other excellent data sources such as the Stockholm International Peace Research Institute in Sweden.
- **No Secret Information** - All information provided to the Exchange will be widely and rapidly shared as time and resources permit.
- **Sharing Information** - It is hoped that nuclear powers will share information on their false alarms and weapons accidents. A sharing of such information will greatly increase their own security by helping reduce the common danger of an unintentional nuclear war. For example, imagine if the Soviet Union, England, France or China were to describe their accidents and false alarms. It might do more to speed up efforts in the world for arms reduction agreements than any other action.

### **I.B. Is U.S. In Launch-On-Warning Position Now?**

If a nation puts its missiles in a Launch-On-Warning (LOW) position, it can be extremely dangerous. This is so because it is much easier for a warning system or computer error to trigger an accidental nuclear war. Because of the extraordinary peril and the difficulty in obtaining clear statements from governments whether they are on LOW or not, all of the following assessment studies conservatively assume that nations would not go to a continuous LOW position except in a crisis.

Because of its critical nature, however, the assumption that no nation is on LOW needs to be evaluated as carefully as data permits. The following policy assessment was made for the U.S. because that is where there is the most information. It must be kept in mind, however, that what applies to the U.S. most likely applies to other nuclear powers.

The U.S. Department of Defense will not admit that LOW is official policy. An extensive consideration of military reports, posture statements and Congressional testimony is reported in the book. This evidence

reveals that a LOW policy does indeed exist, it all depends upon how LOW and Launch-Under-Attack (LUA) are defined.\*

It seems that U.S. officials define LUA as a form of LOW because they appear ready to launch ICBMs when both types of sensors (infrared and radar) indicate that enemy missiles are on their way. This is contrary to what the public believes to be LUA. People generally think of LUA as meaning that nuclear explosions are occurring on one's soil. Under the public's concept of LUA, we could not launch to a false alarm. Under the official concept of LUA, if both sensors are wrong, we could launch on the basis of a mistake.

The drive to improve weapons technology is building a nuclear time bomb. For example, the introduction of MX missiles into Minuteman silos will magnify the danger because they have the accuracy to threaten Soviet silos, thus forcing the Soviets into a stricter LOW policy which makes it easier for them to launch to a misunderstanding. Another example is the program to improve sensors because it could promote false confidence in increasingly complex mechanisms for our security. Another aggravating factor is the Strategic Defense Initiative (Star Wars) because it will make the world's fate dependent upon computerized decision-making systems that can never be completely tested.

## ASSESSMENT STUDIES

One of the reasons there have been so few accidental war assessment studies is that it is not generally known that such studies could be done or how to do them. Therefore, the purpose of **The Nuclear Time Bomb** book is to show how such studies can be accomplished and further developed. The remainder of this booklet provides a nontechnical summary of each of these studies.

## II. OVERALL WAR ASSESSMENT MODELS

### II. A. On The Inevitability And Prevention Of Nuclear War - Dr. Martin E. Hellman, Stanford University, California

If our quest for national security is to prove successful, we must deal from a base of reality, not illusion. Yet most people suffer from one or more of three common illusions. This paper uses the scientific method to examine and dispel each of these illusions.

First illusion - Even if a nuclear war occurs, we will somehow survive. **Response:** Overwhelming evidence is cited to show that World War III would be of a totally different character from anything in our past experience.

Second illusion - Nuclear war is so horrible, no one would let it happen. **Response: It is shown statistically that the continual use of deterrence or any other strategy that has a chance for accident or miscalculation guarantees the destruction of civilization.** On our current path, World War III is not just a possibility it is a mathematical certainty. The only way to survive nuclear roulette is to move to a WORLD BEYOND WAR.

Third illusion - I, as an individual, cannot make a difference. **Response:** A world beyond war is becoming possible in two ways: technologically and through human will. While technology has presented us with the nuclear ultimatum, it has also provided us with the opportunity to eliminate hunger, over-population, and other root causes of war.

While it cannot be proved that humans have the capacity to move beyond war, the only logical choice is to assume that we can. If we assume we are not capable of growth and survival, we will not survive. If we assume we are capable, we have a chance to survive. There is nothing to be lost and everything to be gained by assuming the nobler hypothesis and trying.

### II. B. The Prediction Of War Using Tensiometers - Dr. Alan Newcombe, Peace Research Institute, Dundas, Canada

The Tensiometer is based on a formula that uses mathematical indicators to predict wars. It was developed over a 14 year period and has been reported in a series of papers. It was based on a study of wars from 1950 through 1978. It was found that the "over-armed nations", those with highest per capita expenditures for arms, are 30 times more likely to be involved in an international war within 5 years following the year of the study than are "under-armed nations".

All nations claim that their military expenditures are made for defensive purposes and if they are strong enough it will act as a deterrence factor. However, since it was found that it was the over-armed nations that fought international wars, it must be concluded that the deterrence hypothesis is not necessarily valid.

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\*The U.S. Dept. of Defense now uses the ambiguous term of "unambiguous warning."

Keith Otterbein made a study of primitive tribes. His findings were similar, in that those tribes which spent the most for war preparations were the most likely to go to war.

The Tensiometer can help measure accidental nuclear war proneness. For instance, the greater the tendency for a war to happen, the greater is the possibility of it occurring by accident or miscalculation. War risk information can be used in a similar manner as insurance companies use statistics to identify accident risk. For example, insurance companies have reduced their risk by predicting that older students, with good grades, who don't drink and drive are much less likely to have auto accidents. In a similar manner, we need to consider how the Tensiometer can be used to identify high war risks for focusing prevention efforts.

### **II. C. Calculating Pandora's Box: The Methodology of Risk Analysis - Dr. Daniel Frel, Univ. of Zurich, Switzerland**

The literature on the risk of unintentional nuclear war so far has been overwhelmingly concerned with the probability of various dangerous events triggering a war. While probability should be our main concern in modeling, it is also important to include estimates of the range of damage expected. Damage estimates could vary from one warning shot to a devastating nuclear winter-type doomsday scenario.

Most of the probability risks conducive to the outbreak of an unintentional nuclear war are independent from each other. For instance, the risk of a faulty computer chip causing a false alarm has nothing to do with the risk of human failure by a submarine commander from mental problems. Things can be very different, however, if the risk factors are interdependent. For instance, a mistaken missile launch by one power could be misinterpreted as an intentional attack by another power. In this case, even if the probability of each individual risk factor is extremely low, the overall risk could nevertheless be very serious and alarming.

What we really need to know is precisely which risk factors on the level of weapons technology and command and control systems are affected by the nature of an acute international crisis as compared to situations of "normalcy". Nuclear war risk assessment ought to be increasingly focused on this issue about which we assume so much and know so little.

### **II. D. Lewis Richardson's Models And Accidental Nuclear War - Dr. Paul Smoker, University of Lancaster, England**

The interactions between Soviet and U.S.A. forces are not a constant. Paul Bracken argues that in peacetime the interaction between the two forces are characterized by isolated threatening actions, which can be managed precisely because of their isolation. But once warning and intelligence systems are stimulated beyond a certain threshold, or once a certain level of alert has been ordered by political or military authorities, the situation may alter dramatically. The interdependencies and synergies that were safely ignored during the peace time cat-and-mouse game begin to enter the picture. Then the overall effects of both Soviet and American actions might be to aggravate the crisis, forcing alert levels to rapidly ratchet upward worldwide greatly increasing the danger.

Richardson's mathematical model of an arms race has become a classic paradigm for studying the escalation process. His model can be adapted and used to explore the consequences of the escalation process in a crisis.

### **II. E. A Microcomputer Model For Exploring Dynamics Of Arms Race - David Kreutzer and Dr. John Sterman, Massachusetts Institute of Technology, Mass.**

A microcomputer workshop, "Exploring the Dynamics of Arms Races", is being developed to encourage participants, to explore, test and discuss the impact of alternative arms-building policies. Participants adjust competing countries' parameters, one at a time, on a simulation model to reflect the most plausible and rational policies they think each country could adopt. For example, a participant can represent one country's tendency to overestimate the strength of the other and underestimate its own strength.

Advice is being solicited on the technical and psychological correctness of the model and workshop from high school and college students, teachers, business people, visitors from the Soviet Union and members of our own defense establishment. The workshop is part of a larger ongoing project to develop educational software for use in home, schools and businesses to illustrate how simulation models can improve understanding of complicated problems. The work is being done at the System Dynamics Group, MIT, Sloan School of Management, 50 Memorial Drive, Mass. 02139.

If accidental nuclear war risk factors were included in the model, participants could begin to obtain a better understanding of these dangers. In a later study in the book, III. D., an analytical model has been developed which might be used in combination with the MIT model for this purpose.

### III. TIME SENSITIVE ANALYTICAL MODELS

#### III. A. Accidental Nuclear War: A Risk Assessment - Dr. Michael Wallace, University of British Columbia, Canada; Dr. Brian Crissey, Linfield College, Oregon; and Dr. Linn Sennott, Illinois State University, Illinois

In the past few years, a growing number of scientists and technical professionals have been re-kindling a concern over the danger of accidental nuclear war. They are concerned that, with a growing level of tension and confrontation between the superpowers the institutional checks and restraints against premature launch will fail to function as effectively as in calmer times.

Most of the past studies of accidental war dangers during a crisis have been largely anecdotal and inferential. But this does not mean that all aspects of the issue are beyond systematic, quantitative analysis. The amount of time available to respond to a warning of enemy attack can be estimated under a wide variety of conditions with reasonable precision. The rate at which false alarms are generated within the warning systems are also available. With these estimates and the aid of some fairly simple mathematics, it is possible to calculate the magnitude of the danger of accidental war with some precision. Using a series of analytical models (computerized mathematical) the danger is projected so as to know better how to prevent it.

It was concluded that there is almost a 50% chance of a war-threatening false alarm of some type occurring during a severe, lengthy crisis. It is important to emphasize, in the above calculation, that some very optimistic assumptions have been made. First, it was assumed that the performance of the Soviet C<sup>3</sup>I system is essentially equivalent to the American. If its system is poorer, the danger could be greater. Second, it was assumed that the rate of false alarms remains constant during a crisis which is highly unlikely. Third, it was assumed the danger of human error does not increase during a crisis. Psychological studies are virtually unanimous in demonstrating a sharp decline in performance under stress. The next crisis could be very serious.

#### III. B. Launching Policies And The Threat Of Unintentional Nuclear War - Dr. Brian L. Crissey, Linfield College, Oregon

The arms race is a positive feedback loop, with actions of one side provoking corresponding actions from the other. If either side launches nuclear weapons at the other, intentionally or unintentionally, the expected reaction cycle can be presumed to destroy the world. Hence it does not matter which side fires first. Both sides always lose. What matters is that the first missile not be launched. To see how a missile could be launched unintentionally, we must study the ways in which missiles are launched intentionally. A computerized mathematical launch sequence model was then developed for assessing how missiles could be launched unintentionally.

Figures 1 and 2 illustrate the factors that are taken into consideration in the analytical models used in the studies reported in this and the prior section (III.A. and III.B). Note how short is the available decision time.

Figure 1 shows graphically the meanings and interrelationships among the various components of the attack sequence that might occur if the Soviets were to attack the United States with ICBMs. Note that either Launch Under Attack or Launch on Warning give substantial, although not generous, amounts of decision time to the decision-makers.

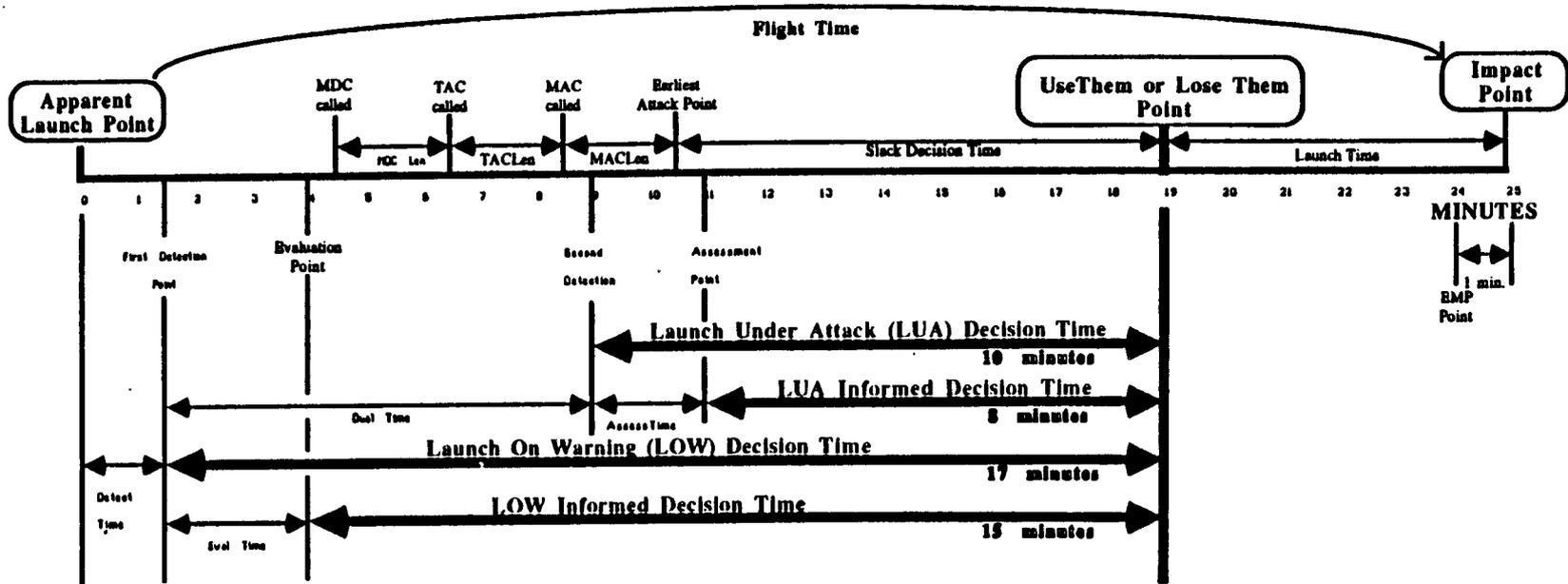
Figure 2 is a graphical representation of a potential first strike of American Pershing II missiles in West Germany against command and control centers in the Soviet Union. Observe that Launch Under Attack offers very little premium decision time, since the Use Them Or Lose Them point occurs only four minutes after the confirming evidence of the impending attack. This is inadequate, especially when the command centers threatened would control the launch of ALL Soviet strategic missiles. Launch On Warning, by contrast, may offer up to eight minutes of decision time, giving Soviet decision-makers a strategic push towards the Launch On Warning posture except that a false alarm could greatly increase the danger of an accidental nuclear war.

Using these analytical models with missile data of the above type, the possibility of an unintentional nuclear war was estimated. Taking the frequency of crises into consideration, along with average combinations of low, medium and high missile arrival and resolution time, an unintentional missile launch was statistically predicted by 2,012 AD. Such an estimate indicates that the trend in modern nuclear weapons and their launching policies place imminent limits on humanity's future unless nuclear policies are changed throughout the world.

Figure 1

## The Launch Sequence Model Time Line

Example: Soviet ICBM Attack on the United States (pessimistic assumptions)



### LEGEND

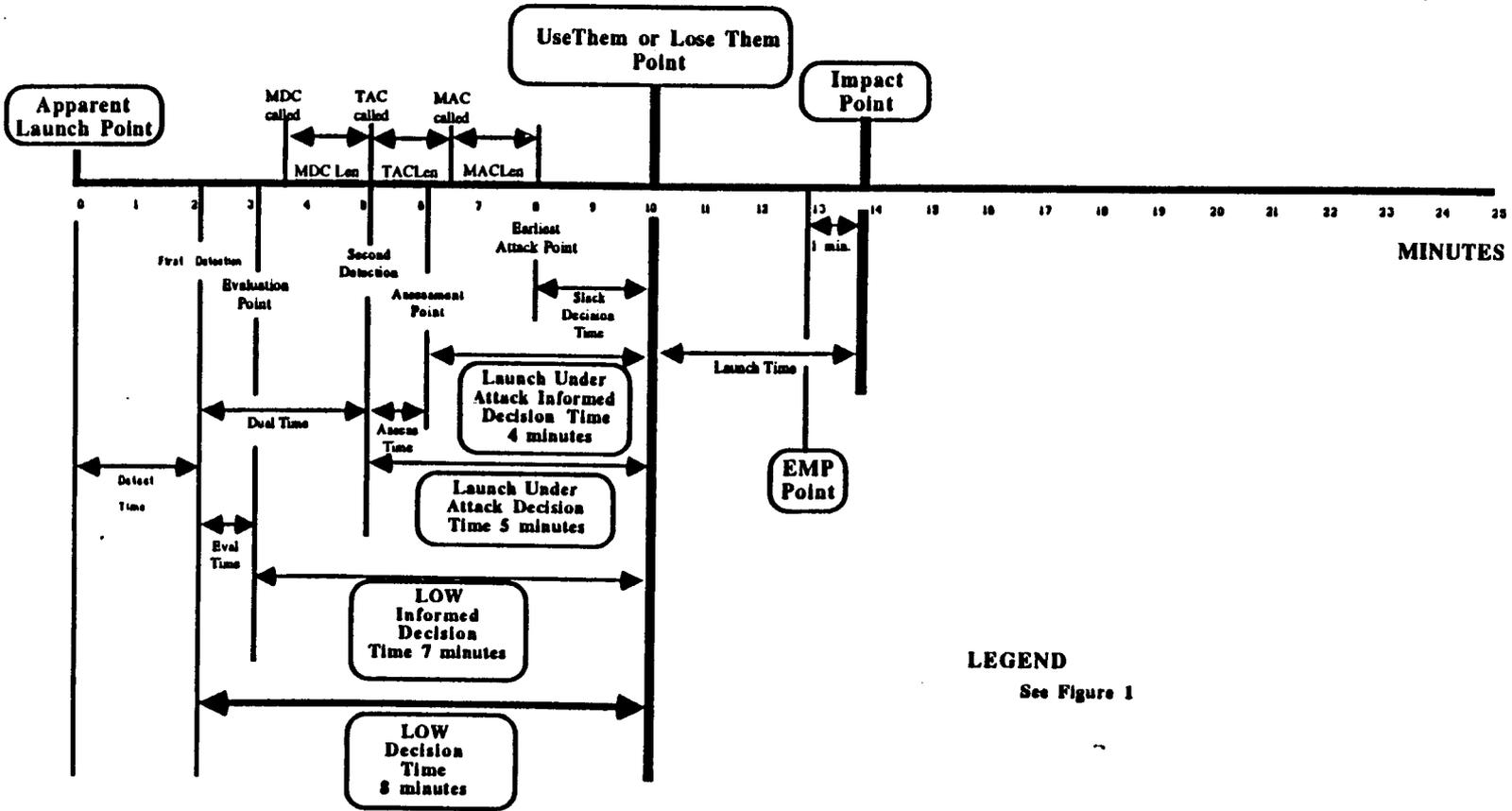
**Launch Time:** Time presumed first strike is launched. (zero)  
**Flight time:** minutes, Launch Point to Impact Point, suspected attacking vehicle  
**Detect time:** minutes, Launch Point to detection by defender  
**First Detection Point:** Launch Point + Detect Time  
**Eval Time:** minutes to evaluate detection  
**Evaluation Point:** First Detection Point + Eval Time  
**MDC called:** Time at which Missile Display Conference is convened  
                   = Evaluation Point + 0.5 minute  
**Dual Time:** minutes to receive dual phenomenon evidence (confirmation).  
**Second Detection Point:** time of confirmation = First Detection Point + Dual Time  
**MDC Len:** length in minutes of Missile Display Conference  
**TAC called:** time when Threat Assessment Conference is convened  
                   = earlier of (Second Detection + 0.5 min, MDC called + MDC Len)

**Assess Time:** minutes to assess confirming evidence  
**Assessment Point:** Second Detection Point + Assess Time  
**TAC Len:** length in minutes of Threat Assessment Conference  
**MAC called:** time when Missile Attack Conference is convened  
                   = Earlier of (Assessment Point + 0.5 min., TAC called + TAC Len)  
**MAC Len:** length in minutes of Missile Attack Conference  
**Earliest Attack Point =** MAC called + MAC Len  
**Launch Time:** length in minutes to fire missiles presumed to be endangered  
**Flight Time:** length in minutes from Launch Point to Impact Point  
**Use Them Or Lose Them (UTOLT) Point =** Flight Time - Launch Time  
**EMP Point:** time of ElectroMagnetic Pulse = Flight Time - 1 min.  
**Decision Time:** minutes from first or second detection to UTOLT point  
**Informed Decision Time:** mins. from evaluation or assessment to UTOLT point.

Figure 2

# The Launch Sequence Model Time Line

Example: American Pershing II Attack on the Soviet Union (optimistic assumptions)



LEGEND  
See Figure 1

## **II. C. The Probability Of Accidental Nuclear War - Lt. Barbara Marsh, U.S. Naval Postgraduate School, California**

Six false alarms occurred at the NORAD (U.S. & Canada joint warning system) in 1978, 1979, and 1980. These false alarms subsequently generated an investigation into launch policies and the increased possibility of an accidental nuclear war. A new mathematical model was constructed to address several questions: What is the sequence of events and reasonable timing between events in the missile warning system? How much time do decision makers have to respond to a threat? What effects do United States launch policies have on decision-making time? How likely is an accidental nuclear war?

In order to estimate the danger, a Data Gathering Model and a Decision Model were developed to show the implications of policies such as Launch On Warning and Launch Under Attack for the early warning system. The results show, using conservative parameters, that an accidental nuclear war is not very probable with Launch Under Attack policy, but significantly more likely if the United States adopts a Launch On Warning policy. Using worst case parameters, however, may present a different picture.

(The United States might be in a form of Launch On Warning policy now. See Section I.B. of this booklet or the book.)

## **III. D. Launch On Warning: Accidental Nuclear War Probability Equations - Barbara Leonard, New Zealand Nuclear Free Zone Committee and Dr. Bill Rosenberg, University of Canterbury, New Zealand**

Whether or not a country will launch its missiles in response to a false alarm is dependent upon two important factors. One factor is the country's Strategic Window: the minimum warning time that the country would have of a first-strike attack on its strategic forces. The other factor is whether or not the alarm occurs during a crisis so that a de facto Launch On Warning exists.

Dynamic Model Equations were developed that took into consideration the following: missile tests and space shots, false alarms, strategic window, unresolved within strategic window & their multiplier, launch probability and accidental nuclear war probability.

Simulation runs with computerized mathematical models were made. Using reasonably conservative assumptions (a 2 minute mean false alarm resolution time, a projection of the US historical false alarm rate and a 7 minute Strategic Window) showed a 49% chance of an accidental nuclear war occurring within eleven years if there are five days of crisis a year. If both countries were to establish a permanent Launch On Warning Policy, there would be more than a 50% chance of an accidental nuclear war within 1 year using the above conservative assumptions.

## **III. E. Self-Activation Of The World Nuclear Weapons Systems - Dr. Bernard Bereanu, Institute For Pure And Applied Mathematics, Bucharest, Rumania**

Unlike other arms races during the pre-nuclear era, the race in nuclear weapons between two opposing global powers results in time in a single, uncontrollable, randomly self-activating world nuclear stockpile.

A mathematical model is presented, which takes into consideration the qualitative changes in weapons as well as the inherent random error behavior of complex computer software of Early Warning Systems. The model provides a framework for computing the probability of self-activation of the nuclear weapons system.

Faster delivery to targets of nuclear weapons through technological development and/or deployment of new nuclear weapons vehicles nearer to target can drastically increase the probability of a nuclear war. It is shown mathematically how eventually an accidental nuclear war is a certainty, if arms race trends continue unchanged.

[Dr. Bereanu deserves a special honor for his pioneering work in developing mathematical models to assess accidental nuclear war dangers. He died in 1984 after a lengthy illness.]

## **III. F. Extending Bereanu's Model Of Self-Activation - David Horwood, Critical Path Software, Montreal, Canada**

One of the most critical aspects of the world nuclear weapon system (WNWS) is the extreme vulnerability of command-control. Since it is highly uncertain that it would be adequate to ensure effective retaliation too far into a strike against it, strategic warning takes on increased importance. This, in all likelihood would lead to a de facto Launch On Warning posture at high alert levels when the situation is critical. Thus, the Launch On Warning assumption in Bereanu's model would probably be accurate under very serious conditions.

Given the short decision time, the WNWS is designed for rapid, reflex reaction. It is set to move virtually automatically to higher alert levels in crises. During a crisis the information flow would increase rapidly. Thus, the danger that decision makers would be swamped is a real possibility. The danger of overcompensation and self-exciting would be real. In such a situation, sensor redundancy in strategic warning would, in all probability be lost due to EMP overblast. Critical decisions would likely be made on the basis of satellite data alone.

Thus, in the event of a severe crisis with strategic forces at high alert levels, the Bereanu's model would have relevance. Similar work incorporating Bracken and Blair command and control insights have much to offer in understanding the potential dangers when the world nuclear weapons system is highly stressed. For everyone's security, much more analytical modeling work needs to be performed and applied to policy decisions.

### **III. G. Star Wars, False Alarms And Accidental Nuclear War - Alex Dely, Univ. of Arizona, Davis Monthan Air Force Base and ITT Technical Institute, Tucson, Arizona**

A competitive "Star Wars" defense system would decrease decision time to 2 to 3 minutes. That means the nuclear war button would be controlled by computer systems because there would be no meaningful time for human intervention. The computers in charge of the world's destiny would be hideously complex, extremely vast and could never be fully tested for reliability. They would decide our fate daily. False alarms are likely to increase and just one erroneous decision could be too much.

It is estimated that the "Star Wars" program would need between 19 million and 35 million coded lines. By contrast, the typical word-processing program has 5,000 lines. Many aspects of the unreliability of large scale computers, satellite systems, electronic components and man/machine interface are described.

[Editors' Note: Analytical models similar to those described earlier can be developed to anticipate "Star Wars" (SDI) dangers. The U.S. plans to spend \$26 billion on "Star Wars" research on weapons and sensors. **None of this money** has been requested to assess how such a defense system could increase the danger of an accidental nuclear war. **Why?]**

## **IV. ASSESSMENT CONCEPTS**

### **IV. A. The Error Term And Accident In Nuclear War - Dr. J. David Singer, University of Michigan, Ann Arbor, Michigan**

There are some short-run and mid-run corrections that might consciously be introduced for reducing the magnitude and potency of the error term in predictive models. For instance, while "hot-lines" are useful, it is more important to be alert to and head off impending crisis at an earlier stage because time is so short.

While few of the systematically data-based findings for the extensive Correlates Of War I and II are reported here, certain of the more impressionistic generalizations are applied to the question at hand.

**If we want to avoid accidental fires, we do not place buckets of gasoline, sticks of dynamite, and long criss-crossing fuses all over town and then distribute butane lighters to most of the inhabitants.** The error term is menacingly large. With a mix of knowledge, concern, and good fortune, we need to construct a global system that is safe from conflict. A major shift away from hair-trigger, error-prone, and fundamentally provocative weapons and controls is needed. The nuclear-missile marriage was menacing enough to this fragile planet, but tactical nuclear weapons, MIRV, MX, Trident and SDI have contributed to making the state of affairs more perilous still. Assessing what we are doing is critical.

### **IV. B. Risks, Methods And Values - Dr. Fred Knelman, Institut Gamma, Montreal, Canada**

While it is difficult to measure nuclear war risks exactly, there is no uncertainty that a nuclear war would cause a level of devastation hitherto unprecedented in scope and intensity. The devastation would be so great that a nuclear war is highly unlikely to start intentionally. Thus, the danger of an unintentional nuclear war becomes the ultimate example of unacceptable risk. Since the cost of risk avoidance would be far lower than the costs of a nuclear war, there is a need for risk reduction studies.

Hopefully a threshold of trust can be established if we make our assessments as accurate as possible. If a threshold of trust and sharing can be established, then there is less likelihood that uncertainties in estimates will be seized upon to deny or delay policy implications which might affect the survival of all. In order to make evaluations as accurate as possible, many things can be done. Assumptions need to be made explicit. We need to avoid the "euphoria of gadgetry" that often accompanies the use of computers.

#### **IV. C. Accidents And Deliberation As Elements In The Outbreak Of War - Dr. Paul Williamson, Texas Tech University**

The distinction between war by initiation and war by accident is a fine line. Most war outbreaks involve accidental and deliberate events in so closely connected a sequence of events that there is a need to place war starts in a continuum. This means that analytical modeling should encompass all major wars. And it should view the system as comprised of a continually interacting worldwide system.

The distinction between intended and inadvertent can be blurred by time. Since the causes of a war may be much more apparent after it has occurred than before, we need to be carefully analyzing what we are doing.

#### **IV. D. Related Arms Race Studies**

[Editor's Note: Late in the course of writing the book, several excellent related studies were called to our attention. They are summarized below. If you are aware of any others we, the Nuclear Age Peace Foundation, would appreciate your calling them to our attention so that we can alert those interested.]

##### **1. Alternative Approaches To Arms Control - Dr. Michael D. Intriligator and Dr. Roman Kolkowicz, University of California, Los Angeles, California**

Investigators at the Center for International and Strategic Affairs at U C L A have been using analytical models to assess strategic problems. One conclusion they have drawn is that a proposal to move to a Launch On Warning would be very dangerous. "This proposal essentially establishes a doomsday machine that can be triggered by a false warning, including a failure of communications, computer error, radar error, etc. *The possibility that either or both superpowers has a Launch On Warning system, we stress, is the most dangerous situation the world currently faces.* This is the issue that should be at the top of the list of the arms control agenda (and also should be the subject of public discussion, debate and demonstrations)."

[Emphasis theirs, but we agree.]

##### **2. Experimenting With The Arms Race - Dr. Marc Pilisuk, University of California, Davis, California**

At the University of California at Davis, a study was carried out using a game that simulates certain basic features of the arms race- disarmament dilemma. It was found that there is an unhappy tendency to engage in preemptive attacks out of fear of the adversary, even when there was virtually no chance of success in such an attack. Using a stooge opponent preprogrammed to follow strictly either a matching (tit for tat) or a conciliatory strategy the real subjects moved toward a cooperative or mutually disarmed state.

In a separate study Dr. Pilisuk points out that despite a great concern about nuclear war, surveys show that most people devote little thought to the danger and make no effort toward its prevention. Since this mass denial is one of the predisposing factors toward the possibility of an accidental nuclear war, it needs to be dealt with in future analytical models.

##### **3. Information, Perception, And The Organizational Complex - Dr. David Bella, Oregon State University, Corvallis**

Dr. Bella has developed a large and comprehensive description of how perceptions (attitudes) are derived, stabilized and changed in mass societies (large organizational systems). The study helps to better understand the arms race. The systematic nature of his study makes it very useful to those attempting to intergrate these critical but complex factors into future analytical models. He is now completing a study on the implications of his model for nuclear deterrence.

#### **V. SUMMARY AND CONCLUSION**

##### **Why So Little Study**

One would think that if the world's greatest danger is accidental nuclear destruction there should be a huge uproar of concern. At the very least, there should be a great public demand for further studies assessing how realistic are the scientists' predictions.

Since it may take a public outcry before such studies are made, why is there no such great public clamor? Let us consider some of the social- psychological mechanisms that permit the world to unwittingly become a self-triggering Nuclear Time Bomb with little effort to assess what should be done to prevent it from going off.

- There is little awareness of the urgency of the danger. All governments strive to keep military accidents and warning system false alarms a secret. This secrecy fosters a false sense of security worldwide.
- An awareness that analytical models can be used to project accidental war dangers in order to prevent them is new. Hopefully, as knowledge grows on how to do such studies, many types of evaluations will be made, widely published, and used.

- Most people are reluctant to think about any nuclear war dangers, let alone accidental war dangers. Unfortunately, mass denial can make the peril more rather than less critical.
- While accidental nuclear war dangers are being increasingly discussed by the press, TV and radio, the urgency of the danger is rarely mentioned. Why? The media generally discuss events after they have happened. There was little discussion of the possibility of an accident before the space shuttle Challenger tragedy compared with the vast and continuous discussion afterwards. Unfortunately, an accidental nuclear war could be a one-time event and reporting afterwards would be irrelevant.
- In the long history of humanity, people have felt secure in proportion to the power of their weapons. It has only been in recent years that the growing power and complexity of weapon systems is making them into a self-destructive "Nuclear Time Bomb". The world public is slowly becoming aware of this fact -- too slowly.

### Supports Other Prevention Efforts

It is not intended that accidental war research replace other prevention efforts, but rather that it strengthen them by increasing the world's desire for arms reduction agreements. Such research supports the need for establishing crisis control centers between the U.S. and Soviet Union and improving the hotline. The research also points out how other prevention measures are needed and can be done, e.g. how nations need to allow each other more decision time and how first-strike-capable weapons aggravate launch decisions.

### Action Needed

Since the possibility of an accidental war may be more urgent than generally believed, we must no longer be satisfied with vague assurances or no response from responsible officials. If they can demonstrate that the dangers are not as they seem, we can all feel safer and shall be grateful. If not, then we need to be working to change the direction we are headed. An informative debate over the "Nuclear Time Bomb" projections is vastly preferable to a continuous deadly drift toward our accidental destruction.

An aroused public can affect the direction we are headed. Consider how growing public concern and action has already influenced such issues as arms control, civil rights, nuclear power plants, the Vietnam war, etc. **For the sake of our families, country and world, help us make these scientists' challenging predictions regarding the "Time Bomb" nature of the arms race heard.** In this manner many more assessment studies will be made and discussed so that everyone can decide for himself or herself how urgent is the danger. **If the urgency of the danger cannot be refuted, there should be a growing tremendous uproar in the world for a further changing of direction and therein may be the key to our survival.**

"If we do not change our direction, we are likely to end up where we are headed." - - Ancient Chinese Proverb

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